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AUSTRALASIAN MOLE-CRICKETS OF THE FAMILY GRYLLOTALPIDAE (ORTHOPTERA)

By NORMAN B. TINDALE, South Australian Museum.

Text figs. 1-16.

THE Australasian members of this family have been greatly neglected by recent workers on Orthoptera. The species have not been reviewed previously, and much of the literature dealing with them is scattered in early European works, inaccessible to Australian workers. I am, therefore, much indebted to Messrs. L. Chopard (Paris) and B. Uvarov (British Museum), Professor Dr. A. Reichensperger (Freiburg), and Dr. C. Willemse (Holland) for their courtesy in supplying manuscript copies of papers, sketches, ex-Australian material, etc., and for their notes and comments on types preserved in European museums. For loans of material I tender thanks to Messrs. W. B. Gurney, H. Hacker, F. G. Holdaway, R. Mungomery, A. Musgrave, and A. J. Nicholson, and to Dr. R. J. Tillyard, of New Zealand.

All the known Australasian and one Patagonian species are dealt with, and some observations are made on the life-histories and habits of species of *Gryllotalpa* and *Cylindracheta*.

The types of all but two of the species described as new are in the South Australian Museum. Except where the notation indicates otherwise, the measurements given are to be read as correct to the nearest tenth of a millimetre.

Family GRYLLOTALPIDAE.

The distinguishing features of the family may be briefly summarized as follows: Crickets (mole-crickets, courtillière) of subterranean and aquatic habits, with anterior legs adapted for burrowing. Females with ovipositor obsolete.

The members of the family are, in addition, usually characterized by having a large oval prothorax and powerful forelegs armed with processes, conveniently known as "dactyls." The family is divided into several subfamilies, three of which, being Australasian, are considered here. Although the family is small, the splitting up into such subfamilies is justified because of the great specialization of form and habit which exists.

All the members are water-loving, frequenting light soils and sandy ground wherever there is ready access to moisture. Sandy banks (of creeks, waterholes,

lagoons, etc.) and sandhills are their chief habitats in Australia. Speaking generally, the species found in light soils are clothed in a velvet-like down, whereas those frequenting sand have the clothing sparse or absent.

DISTINGUISHING CHARACTERS OF THE SUBFAMILIES OF GRYLLOTALPIDAE.

A. Body stout. Antennae composed of many short segments. Compound eyes developed; ocelli two (if present). Anterior tibiae with from two to four dactylar processes. Tarsi three-segmented with paired claws. Anal cerci long and filiform. Elytra, when present, modified for stridulation in both sexes	*Gryllotalpinae*
B. Body elongate, cylindrical, apterous. Antennae seven- to eight-segmented; eyes simple; ocelli absent. Anterior tibiae armed with five dactylar processes, tarsi one- or two-segmented, claws modified or absent; cerci abbreviated	*Cylindrachetinae*
C. Size very small, body slender. Head with antennae short, filiform (composed of ten segments in Australasian species); eyes compound; ocelli three. Anterior legs modified for burrowing; posterior legs greatly adapted for jumping; apex of abdomen furnished with four appendages	*Tridactylinae*

Dr. Tillyard (1), in his recently published text-book, has based a diagnosis of the family on his observations of the New Zealand mole-cricket, a specialized form in which the auditory and stridulatory organs are undeveloped; his remarks must therefore be qualified. In most of the species of *Gryllotalpa* the males produce loud stridulating sounds by means of structures developed on the elytra. Sometimes the music is so loud that of one species Roepke (2) has said, "G. hirsuta gehört nämlich zu den lautesten zirpenden Insekten auf Java." The tympani of the ears are situated in the anterior tibiae, and are almost concealed by an overlapping process of the derm, so that only a slit is visible. The tracheae within are very large. A narrow trachea passes up through the femora, and is open to the air by an elongate slit, closed by a hair-margined flap, situated just behind the postero-lateral margin of the pronotum.

It is generally assumed that only male mole-crickets are capable of producing sounds; but an examination of any of the females of the Australian species of *Gryllotalpa* will reveal an apparatus on the under surface of the elytra with which this sex also is capable of making itself heard. An examination of females of the European species, *G. gryllotalpa*, shows that a moderate strigil is similarly developed on the elytra (fig. 4 A). I have observed, on two occasions, females of *G. oya* kept in captivity in a glass-covered vivarium,

(1) Tillyard, R. J., Insects of Australia and New Zealand, 1926, p. 97.
(2) Roepke, W., Treubia, i, 1919, p. 92.

vibrating their elytra and emitting dull, pulsating sounds clearly audible six feet away, and answering the calls of a male confined in another chamber. In stridulating, the elytra, in both sexes, are simultaneously moved laterally in opposite directions. Starting from the position of rest, they are opened until their posterior margins barely overlap, and are then returned rapidly to their former positions.

Sound producing and auditory organs have not been noticed previously in *Cylindracheta*, but nevertheless are well developed. Some members of the Tridactylinae are apparently mute, but in others well-marked stridulating files are present on the elytra, together with what appears to be a dorsal amplifying or auditory tympanum on the first abdominal segment. These organs also have apparently not been described hitherto.

Several species of the family are of economic importance because of their depredations amongst root crops, and because their burrowings help to destroy the banks of water channels and dykes. Various methods of artificial control have been suggested, but their discussion is outside the province of this paper. The known natural enemies of mole-crickets are not numerous, and have been little used for control work. For the destruction of one species (*Scapteriscus vicinus* Scudder) the Surinam toad *(Bufo agua)* was recently imported to Porto Rico from Barbados.

Many mole-crickets are attacked by mites *(Neothrombium)*, of which several hundreds may be present on the one individual. A nematode worm (*Oxyuris korsakovii* Serg.) has been found parasitizing mole-crickets in Asia, and an undescribed species has been found in Australia.

KEY TO THE GENERA OF GRYLLOTALPINAE.

A. Anterior tibiae with two movable and two fixed dactylar processes .. .. *Gryllotalpa*
B. Anterior tibiae with two movable and one fixed process.. *Triamescaptor*
C. Anterior tibiae with two movable dactylar processes only .. .. *Scapteriscus*

The first-named genus is almost universally distributed; *Scapteriscus* was formerly believed to be confined to the Americas, but one species, *S. leptodactylus* Chopard has just been described from Bengal. *Triamescaptor* is peculiar to New Zealand.

Subfamily Gryllotalpinae.

GRYLLOTALPA Latreille.

Gryllotalpa Latreille, Hist. Nat. Crust., Ins., iii, 1802, p. 275, 1804, p. 121; Scudder, Mem. Peabody Acad. Sci., 1869, p. 6.

Curtilla Oken, Lehrb. Nat., iii, 1815, p. 445; Kirby, Syn. Cat. Orth., ii, 1906, p. 4 (full synonymy).

Austrotalpa Mjöberg, Ent. Tidskr. 34, 1912, p. 30 (Type, *A pluvialis* = *G. nitidula.*)

Type. Gryllotalpa gryllotalpa Linn., Europe. The genus *Austrotalpa*, as defined, differs from *Gryllotalpa* chiefly in the absence of clothing on the body, and in the arrangement of spines of the posterior tibiae; the discovery of a form intermediate in character destroys what little value it may have had. The type of *Austrotalpa* is indeed closer to *G. australis* than the latter is to the *G. africana* group. If sub-generic division is desirable *australis*, *oya*, and *nitidula* may be grouped together under *Austrotalpa*.

The frequent absence of the ocelli in apterous and brachypterous forms (but only when the absence of wings is common to both sexes) is worthy of note; in examining a series of several hundred adults of *G. oya* traces of ocelli, usually on one side of the head only, were noted in one or two examples.

The species are generally regarded as very variable. Polymorphism is most marked in *G. africana* and *G. australis;* in the other species, with a more limited distribution, there is little variation except in size.

The genus is known to range in time from the Oligocene of Europe. A male elytron (*Gryllotalpa prima* Cockerell) has been found in the Gurnet Bay deposits of that age in the Isle of Wight; it is unmistakably related to modern forms.

KEY TO THE AUSTRALIAN SPECIES OF GRYLLOTALPA.

A. Pronotum smooth and shining, with or without sparse clothing.
  a. Pronotum without downy-clothing; elytra well developed, males with wings vestigial, females fully winged; ocelli prominent .. .. *nitidula*
  b. Pronotum sparsely clothed, elytra abbreviated; wings vestigial, ocelli not developed .. .. *oya*

B. Pronotum velvety and dull.
  a. Elytra well developed, ocelli conspicuous.
    a. Elytra with dark markings; wings in male abbreviated, in female fully developed or vestigial; first segment of posterior tarsi with external apical spur present .. *australis*
    b. Elytra uniformly pigmented; wings fully developed in both sexes; first segment of posterior tarsi with external apical spine absent or vestigial.
      1. Posterior tibiae armed with internal marginal spines .. .. *africana*
      2. Posterior tibiae unarmed except at apex .. *pilosipes inermis*
  b. Elytra vestigial, wings absent, ocelli vestigial or absent .. *howensis*

GRYLLOTALPA NITIDULA Serville.

Fig. 1.

Gryllotalpa nitidula Serv., Ins. Orth., 1839, p. 307; D'Orbigny, Dict. d'Hist. Nat., iv, 1849-61, p. 307, Atlas ii, Orth., pl. 3, fig. 4; Scudder, Mem. Peabody Acad. Sci., i, 1869, p. 17; Saussure, Mém. Soc. Genève, xxv, 1877, p. 35.
Austrotalpa pluvialis Mjöberg, Ent. Tidskr., 34, 1913, p. 30.
Austrotalpa nitidula Chopard, Ark. f. Zool., 18A, 6, 1925, p. 5.

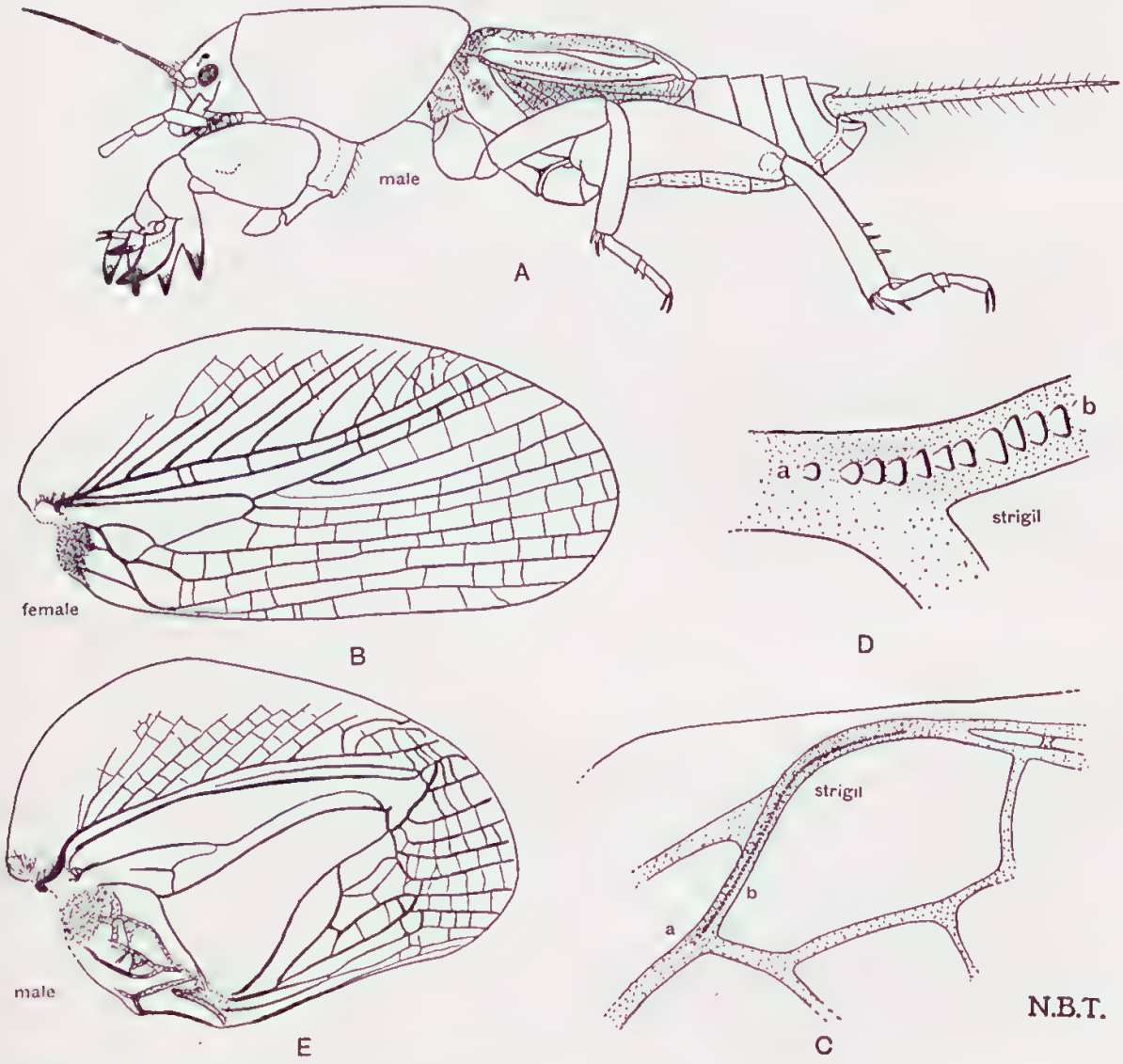

Fig 1. *Gryllotalpa nitidula* Serville. A, adult male × 2; B, elytron, female; C, ditto, portion of underside of anal margin to show strigil; D, ditto, further enlarged; E, elytron, male.

♂ Large, robust, dark reddish-brown. Head broad, smooth, dark reddish-brown, clypeus and labrum pale yellow with darker prominences, the latter covered with coarse reddish hairs; eyes moderate, convex and protruding, black with lighter anterior margin; ocelli small, round, depressed, and very slightly

convex. Pronotum smooth and polished; length-breadth index 73, the anterior margin above lightly concave, antero-lateral margins somewhat abruptly angulate, lateral margins concave, posteriorly well rounded; median longitudinal impression obsolete indicated by somewhat paler colouring. Abdomen dull dark reddish-brown, finely pubescent; cerci stout, longer than pronotum, densely pubescent, long sensory hairs scanty. Elytra reaching beyond hind margin of fifth tergite; greyish and opaque with darker veins and a small basal costal and larger elongate subcostal darker patch. Wings abbreviated (6 mm. in length), normally concealed by elytra. Anterior legs with process of trochanter not densely hairy; lower posterior margin of femora markedly incised at two-thirds; blades of tibiae long, curved, and sharp; first cultrate segment of tarsi with hairy basal area reduced; second and third segments clothed with sparse reddish hairs; claws slender. Median legs with four moderately long tibial spines; apical ventral spines of first and second tarsal segments conspicuous. Posterior legs with tibiae armed with five inner marginal and seven apical (three internal, four external) spines; first tarsal segment with two apical spines, the external one moderate, the internal large. Length, 34 mm.; pronotum, 11·3 mm.; width, 8·2 mm; elytra, 12·5 mm.; cerci, 15·0 mm.

♀ Similar to male. Pronotum slightly wider in proportion to length (index 75) than in male. Elytra long, covering three-fourths of abdomen, opaque brownish-grey, with veins brown; wings long, extending beyond cerci when in repose. Length, 34 mm.; pronotum, 11 mm.; width, 8·2 mm.; elytra, 12·8 mm.; cerci, 12·0 mm.

Loc. Queensland: Blackall Range, Brisbane, Eidsvold. New South Wales: "Lackey River."

Six examples have been examined; they differ little either in form or colour. The descriptions were drawn up from the examination of a male example from Brisbane and a female from the Blackall Range, the latter from same locality as Mjöberg's examples. There can be no doubt that his species, *Austrotalpa pluvialis,* is the same as *G. nitidula.* Of the type of the latter M. Chopard says: "Le type de Serville, au Muséum de Paris, est en très bon état et m'a permis de constater que les individus rapportés par M. E. Mjöberg ne peuvent en aucune façon en être séparés spécifiquement."

The stridulatory file of the female in this species is confined to a single vein of the elytra. An enlarged sketch (× 75 approx.) shows that the teeth vary in size. They are heavily chitinized on their wearing edges, which are somewhat flattened.

GRYLLOTALPA OYA sp. nov.

Figs. 2 and 3.

♂ Moderate, robust; head, thorax, and abdomen smooth, unicolorous dark chestnut-brown, with legs, except extremities of forepair, lighter. Head broad; clypeus pale yellow with darker prominences, and coarse, scattered reddish hairs; vertex smooth, with fine pubescence; antennae chestnut, the joints of each of the basal segments yellowish; eyes small, prominent, ocelli absent.

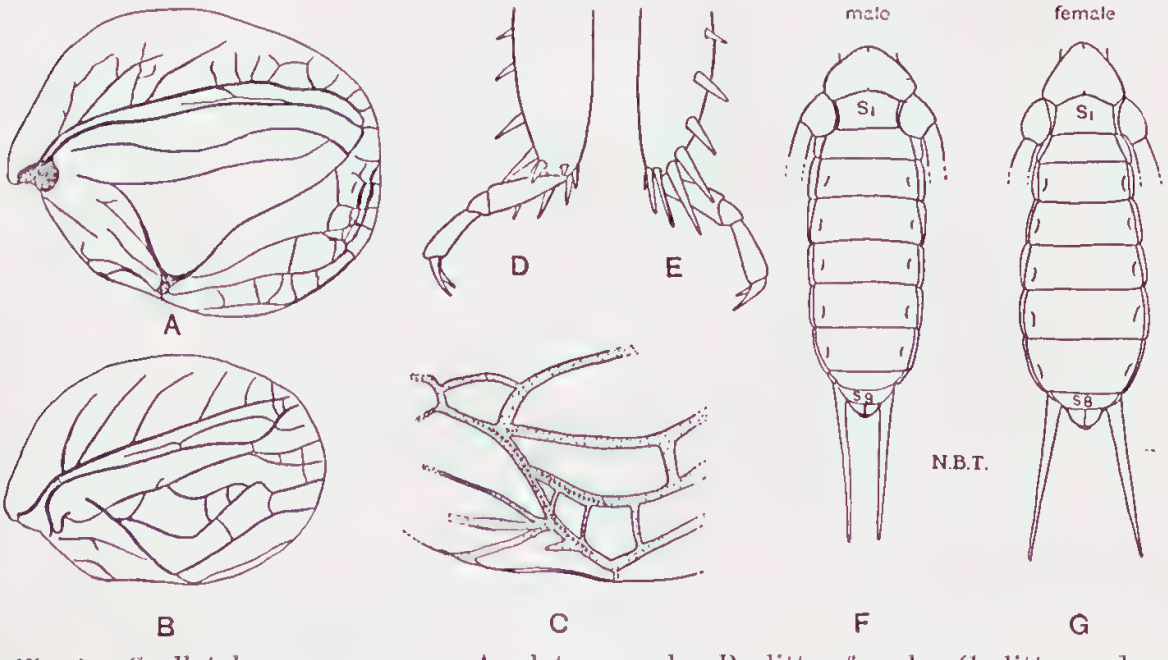

Fig 2. *Gryllotalpa oya* sp. nov. A, elytron, male; B, ditto, female; C, ditto, underside of anal margin; D, apex of posterior tibia and tarsi, external aspect; E, ditto, internal aspect; F, abdomen of male, from below; G, ditto, female.

Pronotum smooth, polished, clothed with fine hairs, front margin evenly concave, length-breadth index 69; median longitudinal impression shallow, marked by a pale line and median area. Abdomen rather long, somewhat slender at base, dorsal segments polished, but rather densely pilose; cerci shorter than pronotum, stout at base, but slender apically, clothed with fine pubescence and long sensory hairs. Anterior legs with tibiae stout, dactyls robust, curved, polished; first cultrate segment of tarsi dark castaneous, highly polished, the basal third densely hairy; claws long and slender. Posterior legs with tibiae armed with an inconstant number of spines (three internal marginal and three internal and three external apical ones are present on the type). Elytra shorter than pronotum, greyish-brown, opaque with veins dark-brown; venational pattern as in fig. 2 A. Wings absent, except as vestigial buds less than 1 mm. in length. Length, 30 mm.; of pronotum, 9·4 mm.; breadth, 6·5 mm.; cerci, 9·0 mm.; elytra, 5·8 mm.

♀ Similar to male, somewhat larger, abdomen longer; cerci shorter. Elytra somewhat smaller, venation variable (figs. 2 B and 3 G). Length, 31 mm.; pronotum, 9·5 mm.; breadth, 6·7 mm.; cerci, 7·1 mm.; elytra, 4·5 mm.

Loc. South Australia: Glenelg (A. G. Edquist and N. B. Tindale), Henley Beach (J. C. Reid and N. B. Tindale), Port Elliott, Kangaroo Island (A. M. Lea). Type, a male, allotype female, and many paratypes, I. 14910, in South Australian Museum.

The name chosen for this species is derived from the aboriginal name (Kaurna or Adelaide tribe) for species of the family. Crickets generally, including probably this species, formed items in the food supply of the natives.

Life history. The egg and first instar larva are unknown. Second instar larvae are about 6 mm. in length (pronotum 2·0–2·5 mm.), very pale brown in colour, with the tips of the anterior tibial dactyls, process of trochanter, and mandibles, chestnut-brown, with darker apices. The dactyls of front tibiae are long and stout, the basal one being rather conspicuous (not, as in *G. africana*, much reduced). The posterior tibiae lack internal marginal spines. (Fig. 3 A).

Third instar larvae are from 7 to 9 mm. in length (pronotum 3·0–3·5 mm.). The chitinous parts are much tougher, but they are similar in colour to larvae of the second instar (fig. 3 B). Small spines are sometimes present on the inner margins of posterior tibiae.

Fourth instar larvae range from 10 to 14 mm. in length (pronotum 3·7–5·0 mm.). They are darker in colour, and the front tibiae are stouter and acutely pointed. Usually one (sometimes two or more) internal marginal spines are present on the posterior tibiae. Elytral buds are not apparent externally. (Fig. 3 C.)

The fifth instar examples vary from 16 to 20 mm. in length (pronotum 5·3–7·0 mm.). Elytral buds are visible, and three or four internal marginal spines are present on the posterior tibiae. (Fig. 3 D.)

In the antepenultimate stage the larvae vary from 22 to 26 mm. in length (pronotum 7·0–8·3 mm.). The elytral buds are well developed (1·1 mm. in length), and there are usually four marginal spines on the posterior tibiae. (Fig. 3 E.)

The adults are a much darker brown than the larvae, the pronotum is usually no longer, but the abdomen of the female is more elongated, owing to the development of the eggs within her body.

Adults and larvae live principally in sand on or near the sea-beach. After showers have moistened the surface of the sandhills their lines of progress just beneath the ground are marked by broken tracks on the surface, and single individuals can be generally secured by digging along these indications. The type examples, together with many others, were taken in this manner. The

winding tracks were measured; the longest noticed extended for 42 feet, and it was evident that the whole distance had been traversed since rain had fallen the previous night; usually, however, the tracks were much shorter.

On being disturbed these mole-crickets eject, with considerable force, a quantity of clear mucilaginous liquid from a gland at the anal extremity of the abdomen. This liquid can be projected to a distance of at least 23 cm. (9⅛ inches).

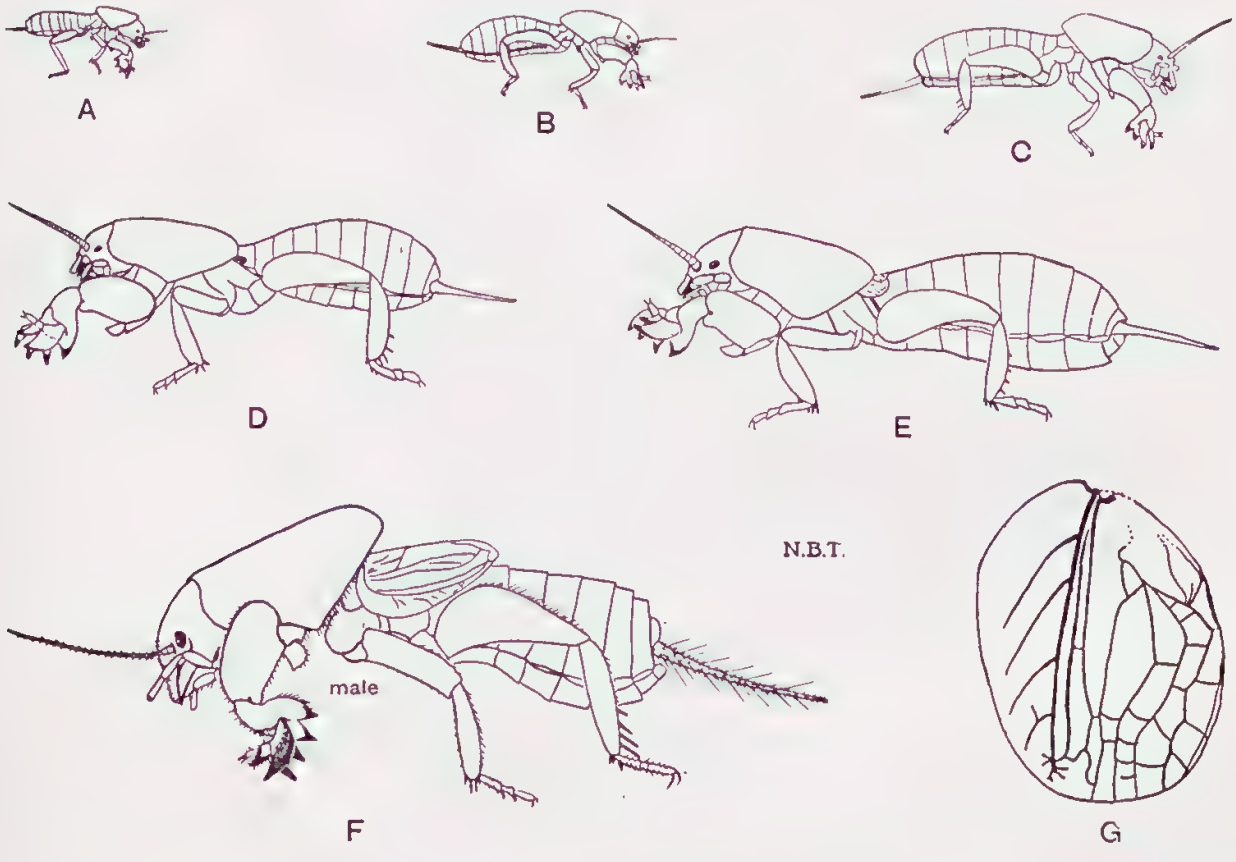

Fig. 3. *Gryllotalpa oya* sp. nov. A, larva, 2nd instar, × 3; B, ditto, 3rd instar; C, ditto, 4th instar; D, ditto, 5th instar; E, 6th instar; F, adult male; G, female elytron.

Their omnivorous habits were first brought to my notice by Mr. J. C. Reid, a carnation grower of Henley Beach, who had suffered a loss of prize seedlings through their attacks. The crickets not only disturbed the root systems by burrowing in the surface, sandy soil, but were observed gnawing through the succulent stems at ground level. On digging up the seedbeds in April, 1926, many hundreds were obtained, in all stages except the first larval one. The burrows of the adults were traced to a depth of three feet; most of the larvae, however, were taken just below the surface. All females secured were barren, and no eggs or egg chambers were apparently present in the seed-beds at that time. Of a hundred adult examples selected at random 62 were males and 38 were females.

GRYLLOTALPA AUSTRALIS Erichson.

Gryllotalpa australis Erichson, Arch. f. Naturg., viii, 1842, p. 249; Scudder, Mem. Peabody Acad. Sci., 1869, p. 16, pl. i, figs. 5, 16, 24, 25; Saussure, Mém. Soc. Genève, xxv, 1877, p. 33.

♂ Head, dorsal surface of abdomen, and parts of elytra, dark brownish-black, ventral surface of abdomen, pronotum, posterior legs, antennae, and cerci dull brown, anterior and median legs reddish-brown. Head moderate, rounded, vertex clothed with fine yellowish pubescence, clypeus whitish with prominences and upper margin dark brown; labrum constricted above, brown, with moderately thick reddish-brown bristles; eyes small, oval, black with white anterior margin, ocelli small, round, and slightly convex, distant the lesser diameter of an eye from the eye itself. Pronotum large, constricted in front, normally velutinous, the median impression moderate, marked by a reddish-brown line from anterior to posterior borders. Abdomen brownish-black, covered with fine ochreous pubescence; cerci as long as pronotum, clothed with long pubescence and many fine sensory hairs. Anterior legs with femora not markedly excised on lower external edge; process of trochanter small and blunt; tibiae much as in *G. africana* but dactyls more strongly curved; first segment of tarsi slender, cultrate blade smaller than in *G. africana;* the second segment short and rather stout; claws sharp, moderately long. Median legs with tibiae armed with four long spines; first and second tarsal segments each with a ventral apical spine. Posterior legs with inner margin of tibiae bordered with four graduated spines, apex internally with three very long spines, externally with four shorter ones; first tarsal joint with two well-developed slender apical spines; the internal one longer than the external one; claws long and slender, two-thirds length of third tarsal joint, the inner claw somewhat longer than the external one. Elytra as long as head and thorax combined, opaque, greyish-brown, with a costal spot, a subcostal elongate triangular mark extending from base to near apex and a broad basal suffusion brownish-black, veins dark brown. Wings abbreviated, nearly as long as, but concealed by, elytra. Length, 25 mm., elytra, 8 mm.; pronotum, 7·6 mm.; breadth of pronotum, 5·8 mm.

♀ Similar in colour to male, somewhat larger in size. Elytra long, with veins of posterior half conspicuously parallel, almost wholly dark brown or brownish-black with darker veins, a narrow costal and apical area greyish. Length, 32 mm.; elytra, 13 mm.; pronotum, 9·0 mm.; breadth of pronotum, 7·0 mm.

Loc. Tasmania: Hobart. Victoria: Healesville, Black Spur, Narbethong, Indi. South Australia: Mount Gambier, Lucindale, Blakiston, Mount Lofty, Blackwood, Lyndoch, Kangaroo Island. New South Wales: Mount Victoria,

Sydney, Bago Forest, Narara, Dorrigo. Queensland: Mount Tambourine. Papua: Mount Yule.

Fifty-five examples have been examined from the above-named localities. One female was taken by Mr. E. Ashby at Blackwood, flying about on a thundery night in March. One example (a fourth instar larva) is exceptional in having on the left side only three dactyls to the anterior tibia (the posterior immovable dactyl being absent). This condition is usually found only in the first instar larva of *Gryllotalpa*, but is characteristic of the adult of the New Zealand genus *Triamescaptor*, described below. The right tibia on this abnormal individual is as in fourth instar larvae and adults. A first instar larva (probably of this species) from Howlong, N.S.W., has only three dactyls on the anterior tibiae.

The type locality for the species is Woolnorth, Tasmania; a typical male from Hobart has been examined for the purposes of the above description; mainland examples are larger. In occasional adult examples the velutinous clothing is unusually sparse, and the surface of the pronotum appears much as in the preceding species. In using the key a little difficulty may therefore occur with old and abraded examples.

In the vicinity of Sydney a dwarfed, wingless form is found, as well as the typical one; this may be distinguished by a varietal name.

GRYLLOTALPA AUSTRALIS var. BRACHYPTERA var. nov.

♀ Similar to typical *G. australis* but smaller. Ocelli present but very small; elytra shorter than pronotum, wings entirely absent. Length, 21 mm.; pronotum, 7·0 mm.; width, 5·5 mm.; elytra, 5·2 mm.

Loc. New South Wales: Sydney, Campbelltown. Type, I. 14911, in South Australian Museum; paratype, K. 3338, in Australian Museum.

The presence of ocelli and the velutinous clothing distinguish this variety from *G. oya*, the only species with which it is likely to be confused.

GRYLLOTALPA AFRICANA Palisot de Beauv.

Fig. 4.

Gryllotalpa africana Pal. de Beauv., Ins. Afr. Amér., 1805, p. 229, pl. 2c, fig. 6; Serville, Ins. Orth., 1839, p. 307; Scudder, Mem. Peabody Acad. Sci., 1869, p. 20, pl. i, figs. 10, 26, 27; Saussure, Mém. Soc. Genève, xxv, 1877, p. 31; Roepke, Treubia, i, 1919, pp. 90-97, pl. vii.

G. orientalis Burmeister, Handb. Ent., ii, 1839, p. 739.

G. coarctata Walker, Cat. Derm. Salt. B.M., i, 1869, p. 6; Sauss., *l.c.*, p. 32; Froggatt, Agric. Gaz., N.S. Wales, xvi, 1905, p. 479, fig. 2.

♂ Dingy yellowish-brown, slightly darker above. Head dark brown, antennae yellow, eyes black, ocelli large, obovate, and somewhat globose, situated

a distance of about the least diameter of an ocellus away from eyes. Pronotum velutinous, front margin evenly concave (fig. 4 C, D); a characteristic median brand conspicuously impressed. Lower external margin of front femora slightly excised anteriorly; tibial dactyls moderately long; first tarsal cultrate segment with only the basal third densely hairy (fig. 4 E), second about one-third the size of first, third twice as long as wide, claws moderately long. Posterior tibiae with four posterior internal marginal and seven apical (4 external, 3 internal) spines. First segment of tarsi with an internal apical spine, sometimes also vestiges of an external spine. Elytra more than half length of abdomen, hyaline, only slightly pigmented at base. Wings in repose, filamentous, reaching to tips of anal cerci (in the typical form). Abdomen dark brown, apex above furnished with lateral rows of rusty hairs. Length, 29 mm.; pronotum, 8·5 mm.; breadth, 7·0 mm.; elytra, 13 mm.

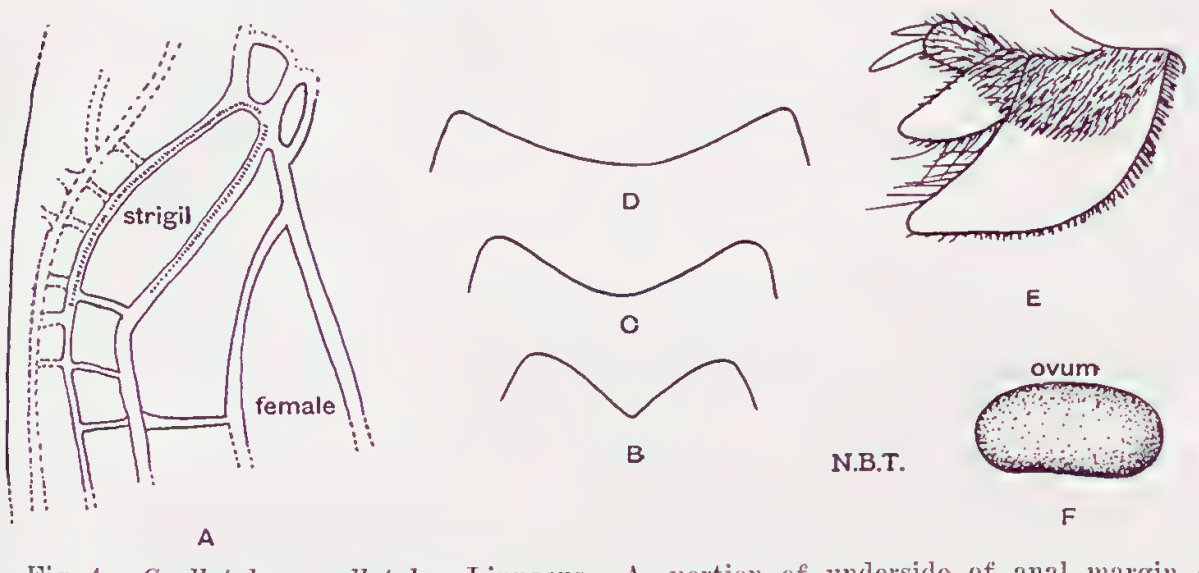

Fig 4. *Gryllotalpa gryllotalpa* Linnaeus. A, portion of underside of anal margin of elytron to show strigil. *Gryllotalpa pilosipes* sp. nov. B, outline of anterior margin of pronotum. *Gryllotalpa africana* Palisot de Beauv. C, outline of anterior margin of pronotum, female, Beverley, W.A.; D, ditto, Adelaide; E, anterior tarsus, external aspect; F, ovum, Adelaide, × 6.

♀ Similar to male, ocelli sometimes smaller, wings less modified for stridulation. Length, 30 mm.; pronotum, 8·2 mm.; breadth, 6·6 mm.; elytra, 12 m.m.

The above descriptions were drawn up from Adelaide specimens, and Indian and African examples have been used for comparison. Brachypterous examples (in which wings do not reach apex of abdomen) occur sporadically, at Adelaide, Wallacia, Sydney, and Beverley. A series of seven, taken at various times along the Cooper Creek between Innamincka and Lake Eyre, are all brachypterous. Roepke (3) records similar examples from Java; he has shown

(3) Roepke, W., Treubia, i, 1919, p. 93.

that the proportion of long- to short-winged examples varies from locality to locality and according to sex. *G. coarctata* Walk. appears to be indistinguishable from *G. africana*. I have examined many specimens identified as *coarctata* by previous workers and cannot find differences. It has been generally assumed that the species from the interior of Australia (*e.g.*, the Horn Expedition material) is *G. coarctata*, but a re-examination shows they are not distinct from *G. africana*.

Loc. Natal: Durban. India: Western Ghats. Java: Buitenzorg. Papua: Mediri, Koitaki, and Fairfax Island (Fly River). Louisiade Archipelago: Misima. Solomon Islands: Ysabel. New Ireland. Queensland: Saibai Island, Thursday Island, Kuranda, Mackay, Yeppoon, Gladstone, Bundaberg, Brisbane. New South Wales: Upper Williams River, Woodford, Wallacia, Sydney, Port Hacking. Victoria. South Australia: Adelaide, Brighton, Murray Bridge, Monash, Mount Bryan, Goolwa, Renmark, Gawler, Virginia, Reynella, Mount Lofty, Lyndoch, Terowie, Leigh Creek, Cooper Creek, Hergott Springs (now called Marree), Innamincka. Central Australia: Oodnadatta, Palm Creek, Gosse Range, Darwent Creek, Ellery Creek, Alice Springs. Western Australia: Cunderdin, Beverley, Roeburne. North Australia: Tennant Creek, Darwin, Groote Eylandt.

The species has also been recorded from some islands of the Pacific, including the Hawaiian Islands (Oahu and Kauai), the Philippine Islands, and Formosa. It is widespread in the tropical and subtropical regions of the Old World.

Life history. From observations made on the banks of the Nepean River, New South Wales, and the examination of series in all stages, selected from a mass of over 5,000 examples taken in a couch grass lawn at Brighton, the following details of the life history are apparent:

The eggs are ovate (2·8 x 1·6 mm.), smooth, and brown in colour (fig. 4 F). The newly-hatched larvae are 4 mm. in length; dark greyish-brown in colour, with a pale median line on pronotum and darkly pigmented hind femora. The front tibiae possess only three dactyls, two movable and one (the lower) immovable; only the apical spines are developed on the hind femora. The eyes are comparatively large, and the ocelli are absent. The larvae are active; when washed out of the river bank they swim rapidly and burrow into the sand at the water's edge with ease.

At the end of the first instar the larvae are much swollen, 6 mm. in length, with the dark part of the abdominal segments alternating with nearly equal widths of lighter chitin, giving the abdomen a conspicuous banded appearance.

The larvae of the second instar are from 6 mm. to 9 mm. in length, light brown in colour, and very active. A second small immovable dactyl is developed

on the front tibiae, the posterior tibiae possess two or more marginal spines, and the ocelli are either absent or but slightly indicated.

In the third instar the larvae are 10 mm. to 13 mm. in length. The second immovable dactyl of the front tibiae is larger and the marginal spines on the posterior tibiae number four or five. The ocelli are usually only just visible.

The larvae of the fourth instar are from 12 mm. to 18 mm. in length. They resemble closely in structure the larvae of the preceding stage, but small swellings on the meso- and meta-thorax indicate the budding wings. The ocelli are noticeable but small. The abdomen has a multimaculate appearance, due to the development of three light patches on each segment; the legs are usually lighter in colour than the body, and the tibial dactyls are dark brown.

The spotted appearance of the abdomen is also present in the fifth instar. The size increases from 18 mm. to 26 mm. The elytral buds are nearly 2 mm. in length and the wing-buds 3 mm. The ocelli are frequently well developed, but in some examples are either small or apparently absent.

An example undergoing the change to the 6th instar shows that the old skin breaks first along the middle line of the pronotum, and may be cast in several pieces. After the ecdysis the larva is light honey-coloured, but becomes rapidly darker. There is some increase in size (or variation) in this instar, and examples measure from 26 mm. to 32 mm. in length, the females being usually larger than the males. The elytral buds are 4 mm. in length and the wings 7 mm. In this and the preceding stage (as in the adult) the sexes can be distinguished by the difference in the numbers of *visible* ventral segments of the abdomen (the male has apparently one more than the female). The ocelli are well developed. All the larval examples described above were taken at Brighton, S.A.; but similar series were also collected at Port Hacking and at Wallacia, New South Wales.

Adults vary from 26 mm. to 33 mm. in length. The female lays her eggs in masses in an oval chamber amongst roots near water's edge. The chamber is of compacted earth or sand, and is two inches long. Eggs dissected from the abdomen vary from light to dark brown in colour, the latter being ready for deposition. The sexes are probably present in about equal numbers. In a hundred examples from Brighton, selected at random from a mass of adults, 54 were found to be females and 46 males. Of the females 51 had deposited their eggs or were barren, and of the remaining three, one contained 36, another 14, and a third only 7 eggs. Miss Brewster (4), who examined, and recorded (under the name of *G. coarctata*) two egg-chambers she found near Sydney, says that each contained about 200 eggs.

(4) Brewster, M. N., Australian Naturalist, iii, 1916, p. 111.

Little is known regarding the duration of the life-cycle. Burakova ([5]), who has studied the life history of *G. gryllotalpa*, states that in Novgorod the life-cycle is completed in from two to two and a half years.

Thomas ([6]) states that the life history of *Scapteriscus vicinus* Latr. of Porto Rica is completed in about eight months.

The adults live in galleries underground, usually in sandy soil near water. They are omnivorous, burrowing amongst the roots of plants to obtain earthworms and insects, and attacking the roots and bases of the stems of seedlings and vegetables. In Africa, Southern Asia, Java, Formosa, and Hawaii this species has been recorded as injuring coffee, cacao, rice, sorghum, opium-poppy, pawpaw, and rhubarb. In Queensland and Hawaii they have been known to injure maize and sugar-cane, the root bands of the latter crop being gnawed, the "eyes," eaten out, and holes made into the interior of the canes. Lawns are frequently injured in the southern parts of our continent, and at Virginia ([7]), in South Australia, wheat crops have been seriously attacked.

At Virginia the mole-crickets follow the tracks of the drill and gather up germinating wheat, storing it in circular chambers some six inches or a foot underground, together with the seeds of clovers (*Medicago* and *Trifolium*). They work with such energy that they sometimes remove every grain of wheat from areas several square yards in extent. It is of interest to note that the acquisitive habits of mole-crickets were formerly denied. As early as 1832 Gray ([8]) said: "Another kind of foresight has also been attributed to these animals [*G. gryllotalpa*]; some will have it, that equally with the *ants*, they transport into their asylum, like the latter, grains of corn, alimentary substances, etc. But for what purpose should they employ such useless care and pains?"

An examination of the stomach contents of several specimens of *G. africana* gave the following results: A sixth instar female larva from Virginia contained vegetable cells, starch, small oil globules, and many small transparent crystals. An adult female from Henley Beach contained large fragments of vegetable tissue, chitinous fragments of an adult, and portions of one or more immature mole-crickets. Another from the same locality contained much vegetable matter and many spines of a fairly large spider.

Adults kept under observation in a vivarium lived for three months on a mixed diet of germinating wheat, trefoil-seed, and dead blowflies. Cannibalism

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([5]) Burakova, L. V., Rev. russe Ent., xix, 1925, pp. 139-142 [In Russian].

([6]) Thomas, W. A., United States Agricultural Dept., Farmers' Bulletin, No. 1561, 1928, pp. 1-8.

([7]) Lea, A. M., Proc. Roy. Soc. South Australia, 1925, p. 302.

([8]) Gray, Griffith, Animal Kingdom, xv, 1832, p. 194.

was in evidence, and several larvae succumbed to the attacks of mature specimens. They were most active after 4 p.m., and stridulating calls were frequently noticed after that hour.

GRYLLOTALPA INERMIS Chopard.

Chopard, Ann. Soc. ent. France, xciv, 1925, p. 30.

♀ "Taille et forme de *G. africana*. Tête brune, front arrondi, les ocelles gros. Pronotum roux clair, fortement rétréci en avant, avec une impression médiane et une ligne transversale deprimée au quart anterieur; bord antérieur très concave.

"Pattes roux clair. Fémurs antérieurs à bords supérieur et inferieur presque droit, à peu près exactement parallèles; processus du trochanter de même forme que chez *africana*, mais un peu plus long; griffes du tarse extrêmement courtes. Tibias intermediaires épais et courts, à éperons apicaux assez courts. Tibias posterieurs à bords supérieurs inermes, presentant à l'apex 2 éperons, externes, très courtes, et 3 internes dont l'inférieur presque égal à l'inférieur externe, les deux autres un peu plus longs; tarses comprimés, assez courts.

"Elytres et ailes comme chez *africana:* veine mediastine présentant 8 à 9 branches épaisses, parallèles; champ dorsal à nervures presque longitudinales et assez regulièrement espacées; veinules formant un réticulation rectangulaire également assez régulière.

"Long, 23 mm.; pronot. 7·5 mm.; élytres, 12 mm.; fém. post, 6·5 mm." (Chopard, *l.c.*)

The unique type of this species (which I have not seen) is said to be from Victoria. It differs from the following in the lesser number of apical spines of the posterior tibiae.

GRYLLOTALPA PILOSIPES sp. nov.

Figs. 4 B and 5 A-E.

♂ Resembles small *G. africana* examples. Head smaller and laterally compressed, dark brown, eyes large and prominent, blackish, ocelli oval, very conspicuous. Pronotum light brown, velutinous, narrow at the front margin, which is deeply sub-angulately concave (fig. 4 B). Anterior legs with femora and process of trochanter nearly as in *G. africana*, the latter somewhat longer; tibiae with dactyls short, stout, and blunt-pointed; tarsi projecting beyond tibial dactyls, first segment large, cultrate, basal hairy portion greater, smooth apical portion less than in *G. africana* (compare figures); second joint small; third twice as long as wide, claws short and blunt. Posterior legs with tibiae without internal marginal spines, six apical ones present, three internal, moderately long, and three external, much reduced; apical internal spine of first tarsal

joint vestigial, claws moderate. Elytra with venation similar to *G. africana* (fig. 5 B). Wings long, when folded reaching to beyond apex of cerci. Length, 24 mm.; pronotum, 7·3 mm.; elytra, 11·7 mm.

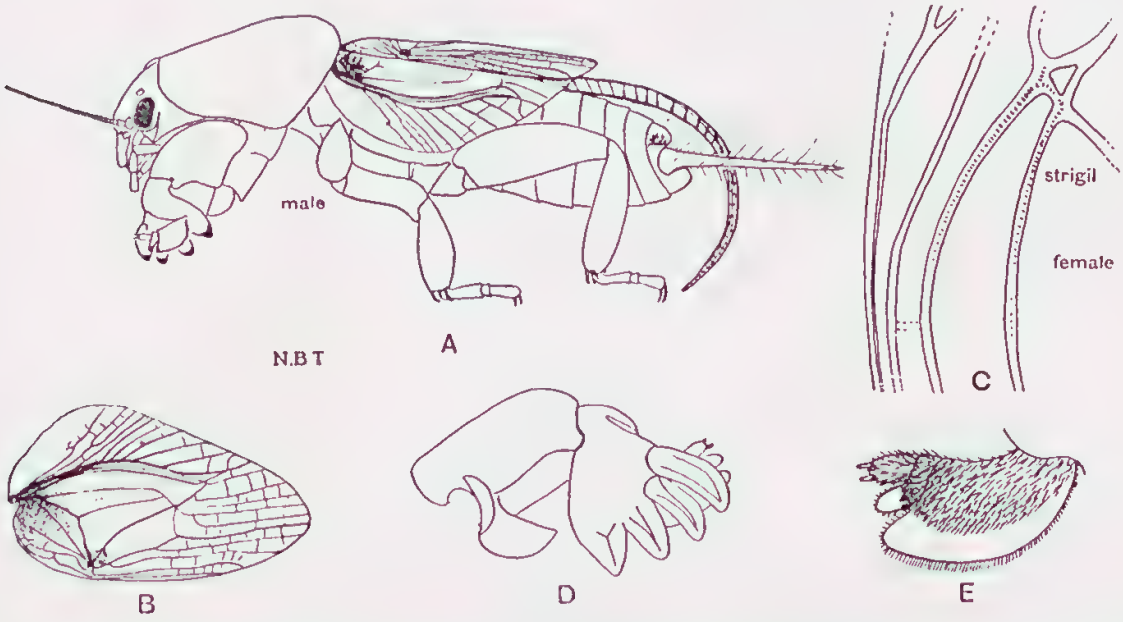

Fig. 5. *Gryllotalpa pilosipes* sp. nov. A, adult male; B, elytron, male; C, elytral strigil in female; D, left anterior leg, internal aspect; E, anterior tarsus, external aspect.

♀ Similar to male. Elytral venation close to that of female *G. africana*. Length, 25 mm.; pronotum, 7·2 mm.; elytra, 11·3 mm.

Loc. North-west Australia: Derby (W. D. Dodd).

Type, a male, and allotype female, I. 14907, in South Australian Museum.

In the description of *G. inermis* no mention is made of the form and clothing of the anterior tibiae; the present species agrees closely, except that the posterior tibiae are differently armed. Further material will possibly show that both are local races of the widespread *G. africana*, and that there are other races, perhaps not so well defined, to be found in various parts of Australasia (for example, the dwarfed brachypterous form of *G. africana* from Cooper Creek).

A portion of the under-surface of the anal part of an elytron of the female is shown in fig. 5 C to illustrate the inverted U-like development of the series of stridulatory teeth in this species. The file is much reduced in the female of *G. africana*, only the teeth on the outer vein being developed.

GRYLLOTALPA HOWENSIS sp. nov.

Fig. 6.

♂ Short, stout, unicolorous light brown; tips of tibial dactyls and clypeus darker. Head robust, vertex prominent, eyes moderate, black, ocelli vestigial

or absent. Pronotum large, length width index 72; median longitudinal impression slight. Abdomen short, stout, cerci somewhat longer than pronotum. Front legs with tibial dactyls long, curved, sharp-pointed, tips polished and black; tarsi with first cultrate joint long, slender, blade smooth and black, second joint hairy, except tip, third joint slender, claws long and sharp-pointed. Posterior legs with tibiae armed with three long internal marginal and seven apical spines, the external three small, the internal four larger; first joint of tarsus with conspicuous apical internal tooth, claws very long and slender. Elytra short, only nine stridulatory teeth present, of which three are heavily chitinized, wings absent. Length, 26 mm.; pronotum, 11 mm.; elytra, 1·9 mm.

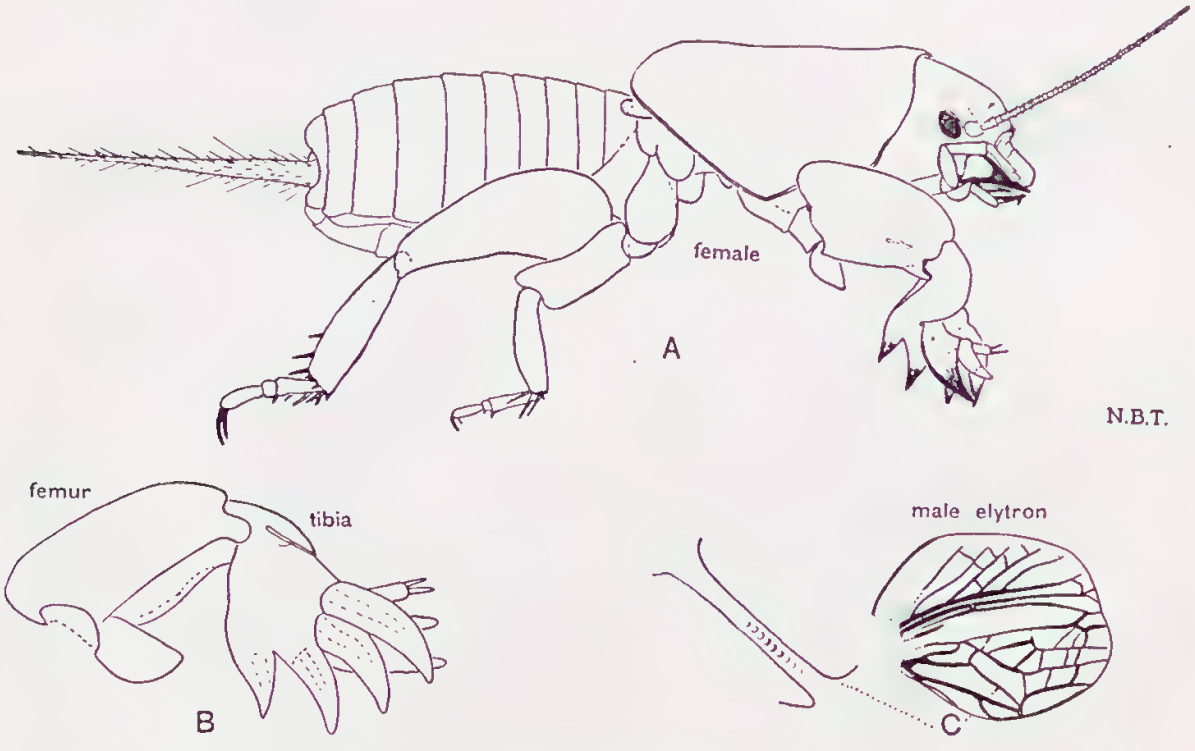

Fig. 6. *Gryllotalpa howensis* sp. nov. A, adult female; B, left anterior leg, internal aspect; C, male elytron, portion enlarged to show small strigil.

♀ Similar to male. Ocelli vestigial, elytra very abbreviated, wings absent. Length, 31 mm.; pronotum, 11 mm.; elytra, 1·1 mm.

Loc. Lord Howe Island (A. M. Lea, December, 1915, to January, 1916, and A. Musgrave, December, 1921).

Type, male, allotype female, I. 14909, and paratypes, in South Australian Museum; paratypes (K. 45687 and K. 55949) in Australian Museum.

Four of the six examples under review are immature, one being a larva of about the fourth instar, and three other nearly mature; all lack ocelli. *G. howensis* is not very closely allied to any other described species.

In both the adult examples ocelli are slightly developed only on the right side

of the head. Stridulation in the male is effected by rubbing the short elytral file (fig. 6 C) against a chitinous protuberance on the metanotum, which is absent or not especially chitinized in some other winged species. The elytra of the females are so reduced that the crickets are probably incapable of producing sounds with their aid.

TRIAMESCAPTOR gen. nov.

Apterous mole-crickets with compound eyes, but without ocelli. Anterior tibiae armed with three dactyls; external indications of tibial auditory apparatus obsolete; cultrate blade of first segment of tarsus reduced.

Type: *Triamescaptor aotea*, New Zealand.

Closely allied to *Gryllotalpa*, of which some authors may regard it as a subgenus. The absence of wings and the three-digitate anterior tibiae are characters of the first instar larva of *Gryllotalpa*. Two views may be put forward with regard to the origin of this genus. We may either regard it as an insular specialization of the world-wide genus *Gryllotalpa*, or as a primitive type with less efficient tibial armature which has been preserved through isolation, and has lost the power of flight in its insular home. Its relationship with species of *Gryllotalpa* is with the purely southern Australian forms such as *G. oya* and *G. australis*, rather than with the widely distributed members of the *G. africana* group.

There are no traces of stridulatory apparatus, and in harmony with its absence the auditory organ on the anterior tibia is absent or vestigial.

Scapteriscus, the American and Eastern Asiatic genus, is separated from *Gryllotalpa* by the absence of both of the fixed dactyls of the tibiae; the present genus is therefore, in regard to this one character, intermediate.

TRIAMESCAPTOR AOTEA sp. nov.

Fig. 7.

♂ Of moderate size; head, abdomen, and posterior femora dark brown; thorax and legs ochreous-brown. Head narrow, triangular, vertex prominent, rounded; labrum convex, rounded, clothed with sparse reddish hairs; clypeus transverse; eyes small, convex, amygdaloid in form; ocelli absent; antennae with basal segment large, longer than second and third combined. Prothorax elongate (length-breadth index 65), ovoid, dull-polished, partly clothed with fine pubescence; anterior margin above concave. Abdomen dark brown, polished, clothed with sparse reddish hairs; cerci longer than pronotum. Anterior legs with femora stout; process of trochanter small, semicircular; tibiae armed with three sharp, stout dactyls, two movable and one fixed; auditory suture obsolete; first segment of tarsi with cultrate blade elongated and slender, second segment

short with cultrate portion moderate, third segment twice as long as wide with long, unequal claws. Median legs with tibiae armed at apex with four long spines; first segment of tarsus as long as second and third combined, first and second ones armed at apex, beneath, with a single spine; claws small. Posterior legs with tibiae armed with ten spines; three of which are on internal margin, and seven apical; of the latter four long ones are on internal margin and three short ones on external margin; two of the latter are subapical and placed widely apart; tarsi with first and second segments unarmed, third segment moderate with stout claws. Length, 26 mm.; pronotum, 9·5 mm.; breadth, 6·2 mm.

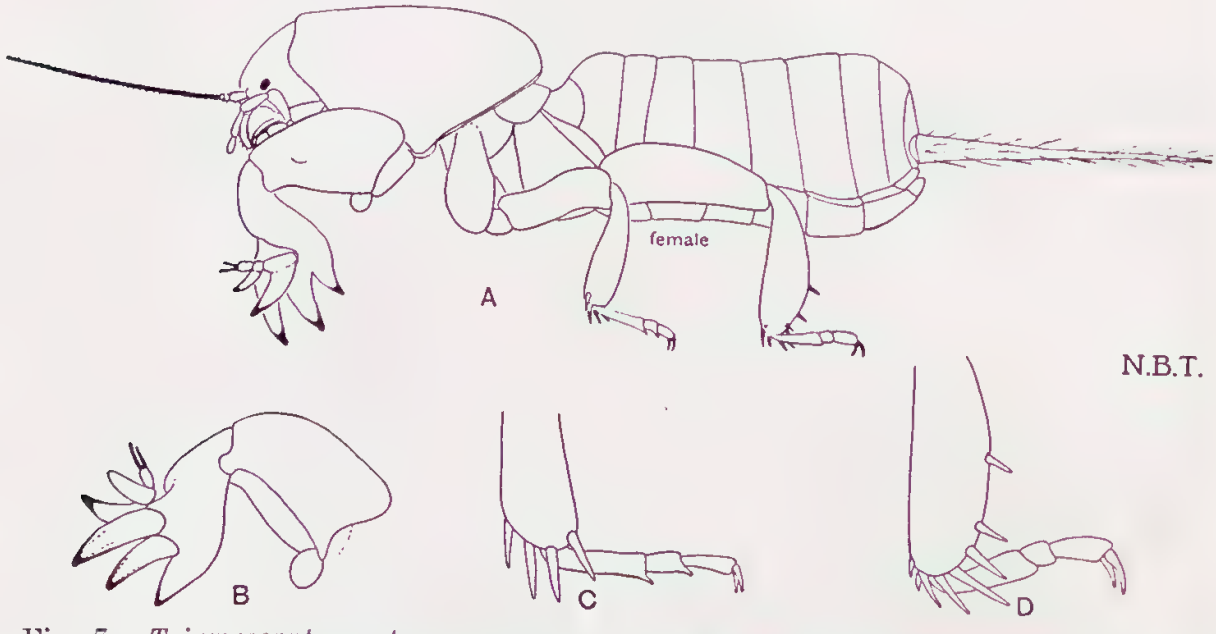

Fig. 7. *Triamescaptor aotea* sp. nov. A, adult female; B, right anterior leg, internal aspect; C, apex of median tibia and tarsus, internal aspect; D, apex of posterior tibia and tarsus, internal aspect.

♀ Similar to male. Pronotum slightly more elongate (index 63). Length, 26 mm.; pronotum, 9·9 mm.; breadth, 6·2 mm.; antennae, 10 mm.; cerci, 12 mm.

Loc. New Zealand: Aramoho, on the Wanganui River, August, 1915; two examples. Type, a male, in Cawthron Institute; allotype I. 14914, in South Australian Museum.

For the opportunity of examining these examples I am indebted to Dr. R. J. Tillyard, who has supplied the following note: "These insects are not generally common throughout New Zealand, and appear to be mostly confined to the North Island, where they have been reported as doing a considerable amount of damage, especially in Wanganui and the surrounding district."

Subfamily Cylindrachetinae.

Giglio-Tos (9) has erected the family Cylindrachetidae for the highly

(9) Giglio-Tos, E., Ann. Mus. Civ. Nat. Genova, xlvi, 1914, pp. 81-101, pl. 1, figs. 1-11.

specialized mole-crickets of this subfamily, but their ancestral relationship with the Gryllotalpinae is probably better expressed by giving them the lower rank.

The distribution of these insects is remarkable, embracing Australasia and southern South America. They are almost blind, apterous, sand-burrowers, whose presence over the whole of the arid parts of Australia, in New Guinea, Melville Island, and the Andes of northern Patagonia, adds to the lengthening list of peculiar families, genera, and species, of animals and plants, which have a southern circum-polar distribution, and are peculiar to these far-sundered regions. One explanation for this type of distribution is the much-discussed Wegener hypothesis of continental drift, which suggests a former contiguity of the southern land masses.

KEY TO GENERA OF CYLINDRACHETINAE.

A. Mesothorax of large dimensions, closely fused with prothorax. Antennae usually seven-segmented in both sexes.. *Cylindracheta*...

B. Mesothorax of small dimensions, divided from prothorax by a constriction, which permits entire freedom of movement between them. Males with seven- females with eight-segmented antennae (after Giglio-Tos) .. .. *Cylindroryctes*

The antennae of one species of *Cylindracheta* were described (possibly in error) as being eleven-segmented, and in the type of a second species (also known only from a single example) the antennae were broken off.

Subfamily Cylindrachetinae.

CYLINDRACHETA Gray.

Cylindrodes Gray, Griffiths, Animal Kingdom, xv, 1832, p. 785; Mag. Nat. Hist. (2), i, 1837, p. 141; Brullé, Hist. Nat. Ins., ix, 1835, p. 191; Serville, Ins. Orth, 1839, p. 310; Saussure, Mém. Soc. Genève, xxv, 1877, p. 38; Saussure and Zehntner, Rev. Suisse Zool., ii, 1895, pp. 422-430 (*nec* Hübner, 1810, a genus of Mollusca).

Cylindracheta Kirby, Syn. Cat. Orth., ii, 1906, p. 7; Giglio-Tos, Ann. Mus. Civ. Nat. Genova, xlvi, 1914, p. 83.

Form cylindrical, mesothorax of large dimensions, closely joined to prothorax. Head with antennae seven-segmented in both sexes (or eleven-segmented); mandibles with sharp cutting teeth; a stridulatory file with many teeth on dorso-lateral margin; maxillary palpi five-segmented, the third article large, a stridulatory apparatus present near base on internal face, composed of a few teeth; eyes simple. Anterior tibiae with large internal auditory chambers, external orifice concealed; tarsi composed of one (or two) segments, without claws. Median and posterior legs capable of folding into depressions on thorax and abdomen; median tarsi composed of two segments with paired (or single)

claws; posterior tarsi composed of a single segment without claws (or two-segmented with a single claw).

Genotype: *C. campbelli* Gray.

The above description has been drawn up from fresh material. The characters in brackets are those given for *C. kochi* by Saussure. If all the features attributed to the two early described species are confirmed on their re-discovery, the three new species described below will require to be placed in a separate genus.

The visual apparatus in *Cylindracheta* consists of a pair of relatively large simple eyes, not as in *Gryllotalpa* of compound ones.

From the examination of sections of the head of *C. arenivaga*, kindly prepared for me by Mr. F. G. Holdaway, it may be seen that the eyes are ocelliform, are covered with a thin cuticular membrane, and possess a large cellular lense, a visual layer, pigmented sheath, and large optic nerve. The condition of the material available for sectioning is not sufficiently good for the appreciation of fine details of structure; the figure given (fig. 9 C) is therefore diagrammatic. In front of the eyes and a little above them there is usually present a thin suture, which apparently ends blindly in the deeper cuticular layers; still further forward there is a pale circular area of chitin (in the position of the lateral ocellus of *Gryllotalpa*). This may be the remains of a degenerate simple eye and homologous with the "fenestra," which is found in a similar position in the cockroaches (Blattidae).

A well-developed, buccal stridulatory apparatus is present in all three of the species examined. In *C. arenivaga* the file consists of about twenty rows of small teeth, arranged in series of from four to seven (fig. 9 G, H). The strigilator is on the third segment of the maxillary palpi, and is formed of a series of seven elongate ridges or teeth (fig. 9 E, F), which move over the strigil in a vertical direction.

An auditory apparatus is present in the anterior tibiae. There is what appears to be a tympanum on the inner margin of the tibiae near the base, in a position normally concealed by the internal apical process of the femora; near this tympanum an elongate internal mass of white tissue (probably an oil gland) is clearly visible through the semi-transparent derm; an enlarged trachea is seen also to occupy two-thirds of the length of the tibia. No external opening to this apparatus has been detected on the tibia, but a well-defined orifice appears to be concealed between the pro- and mesothorax in a similar situation to the thoracic tracheal opening of *Gryllotalpa*.

KEY TO SPECIES OF CYLINDRACHETA.

A. Anterior tarsi two-segmented .. .. *campbelli*

B. Anterior tarsi one-segmented.

a. Median tarsi two-segmented, with paired claws, posterior tarsi one-segmented, without claws.

a. Median tibiae with external lateral longitudinal chitinous ridge; posterior tibiae with ridge obsolete *psammophila*

b. Median and posterior tibiae both with lateral ridges.

1. Median tibial ridge feebly bidentate .. *longaeva*
2. Median tibial ridge strongly bidentate .. *arenivaga*

b. Median and posterior tarsi two-segmented, with single claws (after Saussure) .. .. *kochi*

CYLINDRACHETA CAMPBELLI Gray.

Fig. 8 A.

Cylindrodes campbelli Gray, Griffiths, Animal Kingdom xv, 1832, p. 785, pl. 131; Mag. Nat. Hist., (2) i, 1837, p. 142, fig. 15; Saussure, Mém. Soc. Genève, xxv, 1877, p. 40.

Smooth. Head small, triangular, dark brown; antennae apparently moniliform (only a few basal segments remaining in the unique specimen); labrum small, horse-shoe shaped. Mandibles small, strongly dentate; eyes very small; palpi with terminal joint truncated, somewhat rounded, and slightly enlarged towards the tip. Body very long, cylindrical; thorax reddish-brown, occupying more than a third of its whole length, distinctly divided into pro-, meso-, and metathorax; the prothorax the longest and cylindrical, the other two segments subequal. Abdomen (except the last joint) yellowish-brown with a tinge of darker colour, composed of eight segments, the last the largest, with its apex rounded, depressed and margined above, and devoid of caudal appendages. Anterior legs moderately strong, compressed and dentated in front; the tarsi composed of two long slender segments without a claw. Median and posterior legs yellowish-brown, with darker tinges, very short, compressed, and received in cavities on each side of the body (the cavities which receive the median pair of legs occupy the spaces between the meso- and metathorax, while the third pair are contained in the interval between the metathorax and the first abdominal segment); femora broad and armed at the apex with a blunt spine, serving as a guide to the tibiae when in the act of being drawn beneath them; tibiae broad, compressed, and strongly armed with a short spine at the tip; tarsi biarticulated, ciliated beneath and furnished with a small claw.

The species has not been rediscovered since its first capture on Melville Island in 1826-1827; the above account has therefore been drawn up from Gray's original descriptions and figures.

There is evidence of some confusion in Gray's account with regard to *C. campbelli* and the "wire-worm." He says: "Brought from Melville Island, on the north coast of New Holland, by Major Campbell, who informed me that he was unable to keep a single plant in his greenhouse on account of the ravages of this insect. It bores in their stems; and the withering of the plants alone betrays the secret work of the spoiler. . . . The name given to this insect by the colonists was the 'wire-worm'."

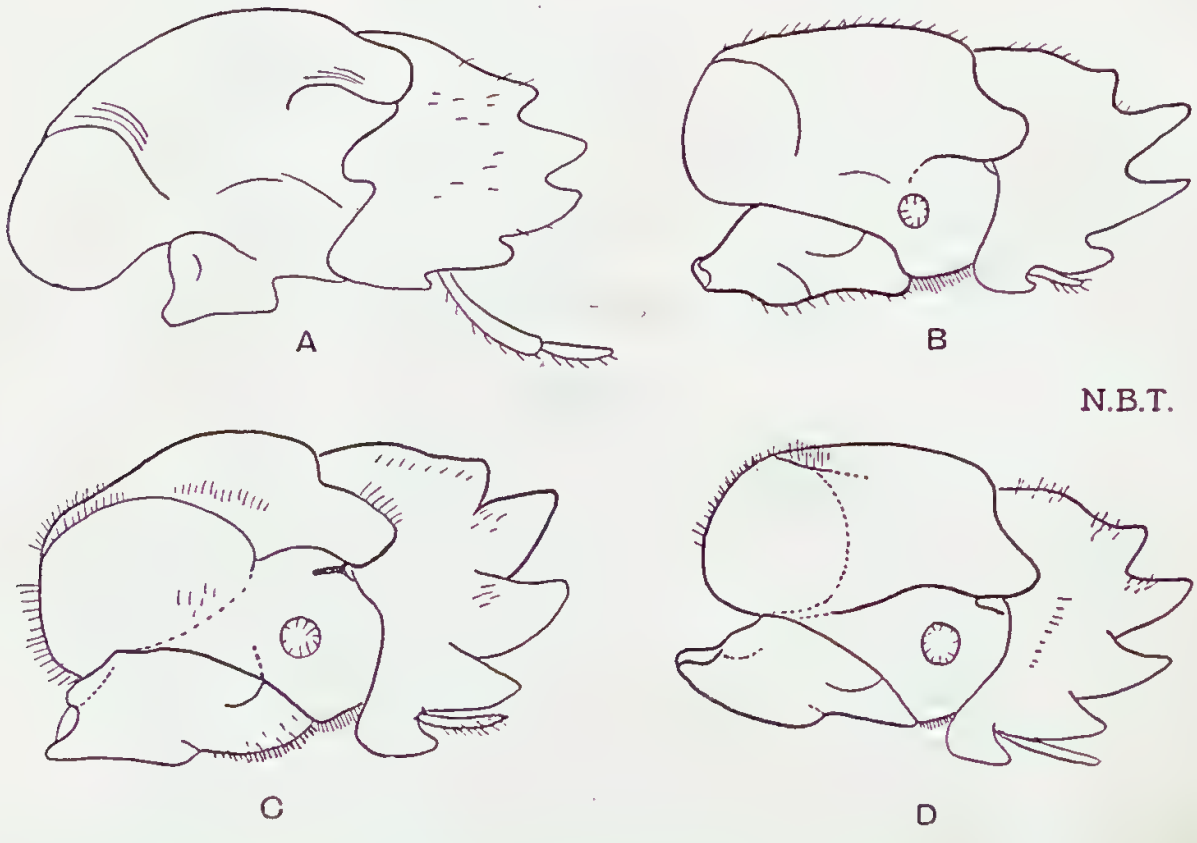

Fig. 8. *Cylindracheta*, anterior leg, internal aspect in: A, *C. campbelli* Gray, Melville Island (after Gray); B, *C arenivaga* sp. nov., Stuart Range; C, *C. longaeva* sp. nov., New Guinea; D, *C. psammophila* sp. nov., Perth.

The term, "wire-worm," in Australia, is generally applied to species of millepedes (Myriapoda), and more correctly to the larvae of Elaterid beetles. Probably Gray has confused two or more statements by Major Campbell relating to different animals. As showing that some misunderstanding has occurred, it should be pointed out that in such an intensely hot climate as that of Melville Island (11° 30′ south lat.) it is most improbable that Major Campbell kept any plants in a greenhouse. On the other hand, in New South Wales and Tasmania, where he also resided, true "wire-worms" are pests in greenhouses, and he may well have been troubled with them.

Both of the species of *Cylindracheta* whose habits are known to us are

burrowers in sand. Is it not possible that the present species also is normally a sand-dweller, and that its discovery in stems of plants (if indeed true) was due to an occasional departure from normal habit, such as been recorded of *Gryllotalpa africana* in Hawaiian sugar-cane? In Major Campbell's ([10]) own account of the Melville Island Settlement the only insects which are mentioned as causing damage to the belongings of the residents are termites, whose ravages amongst the roots and in the stems of living plants are only too well known to those of us who have practised agriculture in North Australia.

This species is distinguished from its congeners by the two-segmented anterior tarsi and by the different anterior tibiae and posterior legs. Gray's figure of the anterior leg was drawn in an inverted position, with the tibia partly dislocated from its socket. The figure (fig. 8 A) has been redrawn, with a modification of position, for comparison with those of the other species of the genus. According to Gray's figures the prothorax is almost twice as long as wide, and is therefore much more slender than in any other of the known species.

CYLINDRACHETA ARENIVAGA sp. nov.

Figs. 8 B, 9, and 10 B-C.

♂ Comparatively small, elongate, cylindrical. Head, thorax, and apex of abdomen smooth, polished, light chestnut-brown; abdomen and legs paler. Head moderately broad, eyes small, broadly oval, fenestrae inconspicuous; antennae moniliform, seven-segmented, basal segment large, third small. Prothorax moderately stout (length-breadth index 73), anterior margin strongly concave, antero-lateral spine not very conspicuous. Mesothorax compressed posteriorly; metathorax laterally compressed. First, second, and base of third segments of abdomen laterally compressed, the first segment flattened above into an amygdaloid shape, the second into a conical shape; third to eighth segments wider than long; apical segment distinctly longer than wide with apex truncate, a median transverse suture above; cerci short, somewhat slender; tenth tergite longer than wide, with the posterior (anal) margin angulate; ninth sternite with posterior margin produced to a blunt median point; copulatory hooks on the tenth sternite conspicuous. Anterior legs with femora stout, internal apical projection well rounded below; tibiae with digitiform blades comparatively long and slender, tarsus one-segmented, short. Median legs with femora stout, two-thirds as wide as long; tibiae stout, with a longitudinal ridge on external face produced into two conspicuous lobes near the apex, which bears also two terminal spines; tarsi two-segmented, with small, stout, blunt, paired claws. Posterior legs with femora stout, nearly two-thirds as wide as long; a plain

([10]) Campbell, Royal Geographical Society Journal, iv, 1834, pp. 129-181.

longitudinal ridge on external face reaching nearly to apex, which is armed with four spines, the external pair rather long and slender; tarsus composed of a single segment, sharp-pointed at apex, without claws. Length, 41 mm.; of pronotum, 6·4 mm.; breadth, 4·7 mm.; cerci, 1·3 mm.

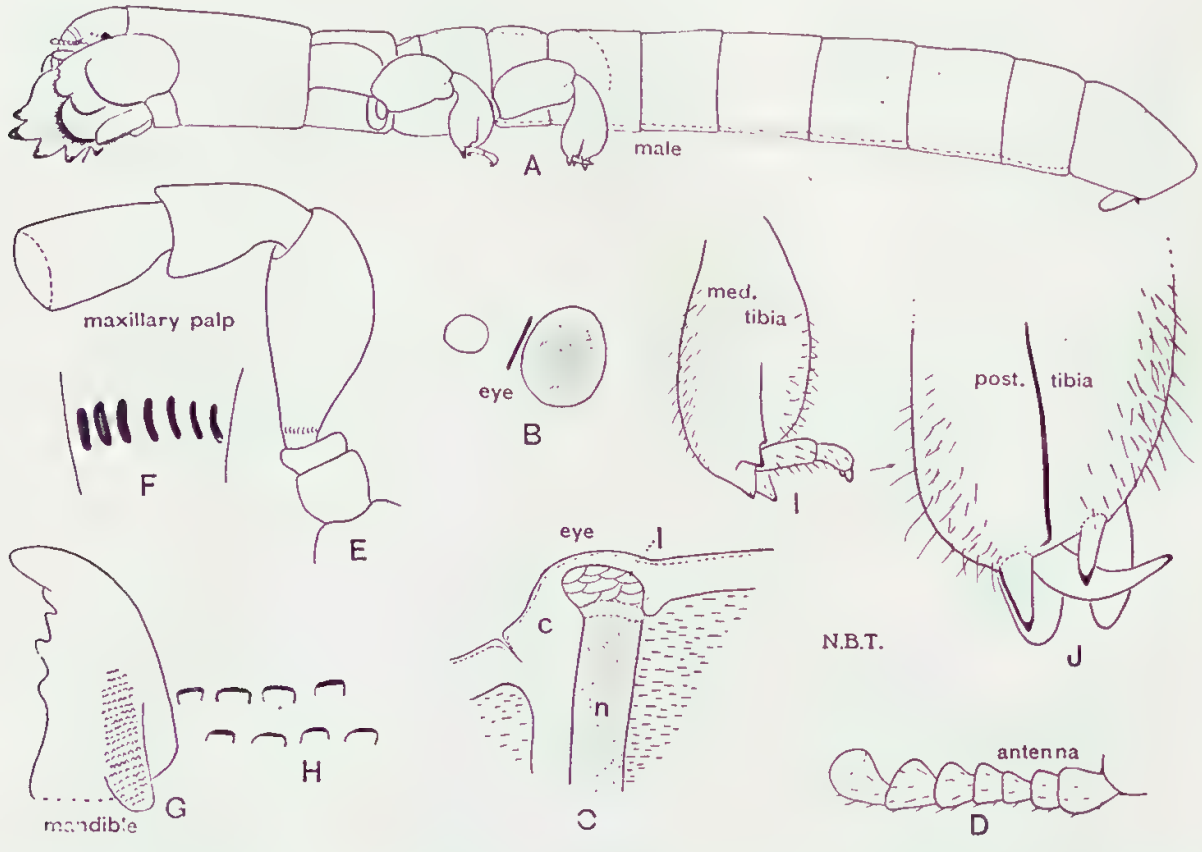

Fig. 9. *Cylindracheta arenivaga* sp. nov. A, adult male; B, eye and fenestra; C, horizontal section of eye (c, cuticular layer; l, lens; n, nerve); D, antenna; E, right maxillary palp showing strigilator on third segment; F, ditto, further enlarged; G, left mandible, external aspect, showing strigil; H, ditto, teeth of strigil enlarged; I, median tibia and tarsus; J, apex of posterior tibia and tarsus.

♀ Similar to male. Prothorax stouter (length-breadth index 83). Abdomen with cerci somewhat stouter, eighth sternite about twice as long as wide, with the posterior margin strongly convex (fig. 10 C); gonapophyses normally concealed. (In fig. 10 D the apex of the abdomen is drawn from an oblique direction with the eighth sternite elevated, to show the positions of the gonapophyses and gonopore.) Length, 40 mm.; of pronotum, 5·9 mm.; breadth, 5·0 mm.; cerci, 1·5 mm.

Loc. South Australia: Fowler's Bay (R. Tate), Denial Bay (J. W. G. Mann), Nullarbor Plain (R. T. Maurice), Wynbring, Ooldea (A. M. Lea), Lake Callabonna (A. Zietz), Strzelecki Creek (E. R. Waite). Central Australia: Stuart Range (F. Wood Jones). North Australia: Tennant Creek (J. F. Field).

The type (a male) from the Stuart Range and the allotype (female) from Tennant Creek, numbered I. 14913, are in the South Australian Museum. This species is widely spread over the arid parts of Australia, and is somewhat variable in size and proportions. Twenty examples have been examined; most of them are constant in having the prothorax three-fourths as wide as long; the type female is exceptionally broad. Three examples from Nullarbor Plain, Wynbring, and Ooldea have the abdominal segments as long as or longer than wide, but I can find no constant differences; much of the apparent variation may be due to contraction or telescoping of the segments.

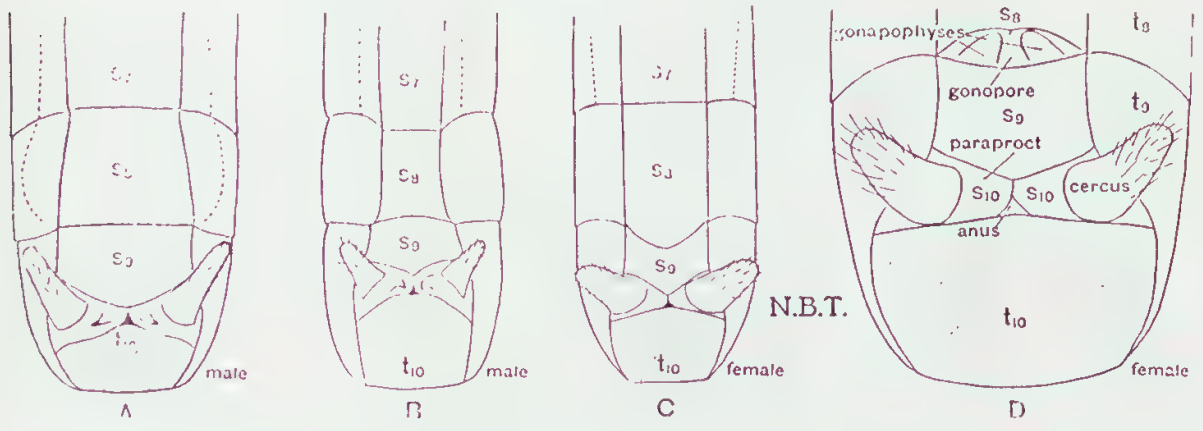

Fig. 10. *Cylindracheta*, apex of abdomen beneath in: A, *C. psammophila* sp. nov., type male; B, *C. arenivaga* sp. nov., type male; C, ditto, allotype female; D, ditto, female, viewed from oblique angle to show rudimentary gonapophyses.

There are seven larval examples of the species in the type material, amongst which may be distinguished what are probably the three instars prior to the adult condition. The two smallest examples are both 20 mm. in length (pronotum 3·0–3·1). They are honey-coloured, with the basal segments of the abdomen and the two posterior pairs of legs creamy-white. They agree in proportions and in the armature of the legs with the adults. Examples of the next instar vary from 31 mm. to 32 mm. in length (pronotum 3·8–4·5 mm.); they are similar in other respects to those of the preceding stage. The antepenultimate instar is represented by two individuals 38 mm. to 39 mm. in length (pronotum 5·9–6·2 mm.).

Examples of these three stages and of the adult, including the type male, were taken by Professor F. Wood Jones. They were burrowing just below the surface of the ground in sandhills at Stuart Range. An adult male of this species was also taken in a similar habitat by the late Mr. E. R. Waite during the South Australian Museum Expedition to Cooper Creek in 1916. He described its capture as follows: "On September 25, when traversing the sandhills in the neighbourhood of Strzelecki Creek, I noticed long tracks in the sand, each

terminating in a round hole; these tracks were often punctured, evidently by birds searching for the contained insect. I made many attempts to secure what I thought might be a mole-cricket, and finally succeeded in obtaining a single specimen.'' This example was figured under the name of *Cylindrodes campbelli* Burmeister in the account of the expedition (11).

Little is known about the life history or feeding habits of these insects. The stomach and intestinal contents of a male example from Wynbring consisted of many fragments of insect chitin and a few vegetable cells, suggesting that the omnivorous habits of *Gryllotalpa* are found in species of this group also.

CYLINDRACHETA LONGAEVA sp. nov.

Fig. 11.

♀ Elongate, cylindrical, light ochreous-brown in colour, with the external faces of the anterior femora and tibiae chestnut-brown. Head moderately broad, eyes small, oval, prominent, fenestrae not very conspicuous, antennae monili-

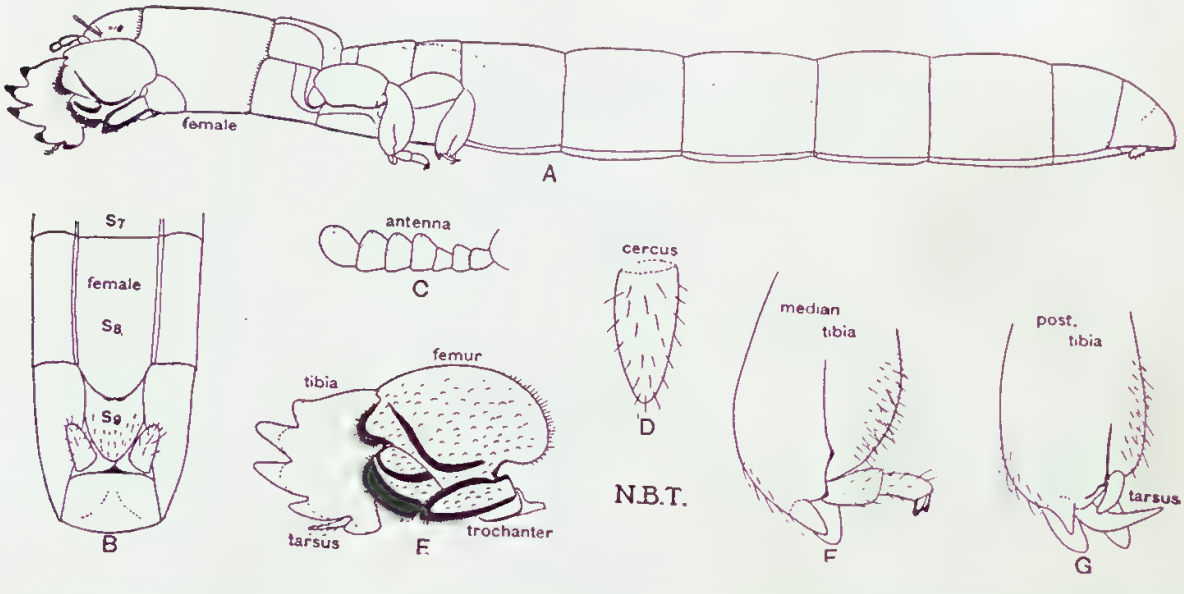

Fig. 11. *Cylindracheta longaeva* sp. nov. A, adult female; B, apex of abdomen beneath; C, antenna; D, cereus; E, anterior leg, external aspect, showing broad elevated chitinous ridges on femur; F, apex of median tibia and tarsus; G, apex of posterior tibia and claw-like tarsus.

form, short, seven-segmented, the third segment small. Prothorax broad, cylindrical (length-breadth index 78), anterior margin evenly concave, antero-lateral spine moderate, densely hairy; mesothorax moderate, compressed posteriorly to permit of the folding in of the median legs; metathorax greatly compressed laterally, with upper margin short, depressed, and lamellate. Three basal segments of abdomen compressed, the first with its upper-surface flat and

(11) Lea, A. M., Trans. Roy. Soc. S. Australia, xli, 1917, pl. xxxiii, fig. 4.

amygdaloid in shape, the second conical, the third compressed only at base; third to seventh segments of abdomen longer than wide, constricted slightly at each joint; the terminal segment bears a median transverse suture; beneath, the eighth sternite is very long, with the posterior margin strongly convex; cerci short and stout, twice as long as wide; the tenth tergite bears lateral depressions for the reception of the cerci in repose, these do not reach apex of abdomen. Anterior legs with femora moderately stout, the inner apical projection sub-rectangular, the chitinous ridges of external face broad (indicated in black in fig. 11 E); tibiae stout, with single-segmented tarsus, moderately long. Median legs with femora nearly four-fifths as wide as long; tibiae stout, with a long ridge on external face projected near and at apex into two rounded prominences, armed apically with two spines; tarsi two-segmented with stout, paired claws. Posterior legs with femora twice as wide as long; tibiae stout, with a short longitudinal ridge on exterior face produced near apex into a blunt spine, preceded by a second slight elevation, armed apically with four spines, the external pair of which are small; tarsus composed of a single, long, sharp-pointed segment, without claws. Length, 56 mm.; of pronotum, 7·7 mm.; breadth, 6·0 mm.; cerci, 1·5 mm.

Loc. New Guinea. Type, a female, unique, K. 55948 in the Australian Museum collection. The discovery of *longaeva*, an ancient inhabitant, extends the range of the subfamily towards the northern confines of the Australasian region. Unfortunately no further details concerning its capture have been preserved.

CYLINDRACHETA PSAMMOPHILA sp. nov.

Fig. 12.

♂ Cylindrical, stout, light chestnut-brown in colour. Head broad, large; antennae moderately stout, short, moniliform, and seven-segmented; eyes ovate, the pale-coloured fenestrae conspicuous. Prothorax stout, broad (length-breadth index 85), anterior margin above gently concave, the antero-lateral protuberances or spines stout and sharp. Mesothorax stout, posteriorly deeply excavated to accommodate the folded median legs. Metathorax compressed, the upper extremity short and lamellate. The three basal segments of abdomen compressed, the first with median ridge flattened and oval, the second elongate, rectangular, the third triangular; the eighth tergite bears a median longitudinal groove (as this is almost absent in a second male example it may be due at least in part to post-mortem deformation), traces of which occur on the adjoining segments; the apical segment of body short, as wide as long, with the sides converging to apex, the apex truncated; the tenth tergite ventral, wider than long, with

elongate lateral depressions for the reception of the cerci, the apical (anal) margin projected and rounded; cerci three times as long as wide, densely hairy; clasping hooks on tenth sternite conspicuous (fig. 12 A). Anterior legs with femora stout; the internal apical process rounded, the chitinous ridges on external face narrow but strongly elevated; tibiae moderate, with tarsus one-segmented and rather long. Median legs with femora very broad; tibiae stout, armed apically with two spines, and bearing a longitudinal ridge on the external face, elevated into two slight broad projections, the one at the apical extremity the larger; tarsi two-segmented with stout paired claws. Posterior legs with femora relatively narrower than those of median ones; the tibiae longer and less expanded, with the hind margin comparatively straight, armed apically with four spines, the external pair the smaller; there is no longitudinal ridge on the external face; tarsus composed of one long segment tapering to a point, without traces of claws. Length, 43 mm.; pronotum, 8·4 mm.; breadth of pronotum, 7·1 mm.; cerci, 2·3 mm.

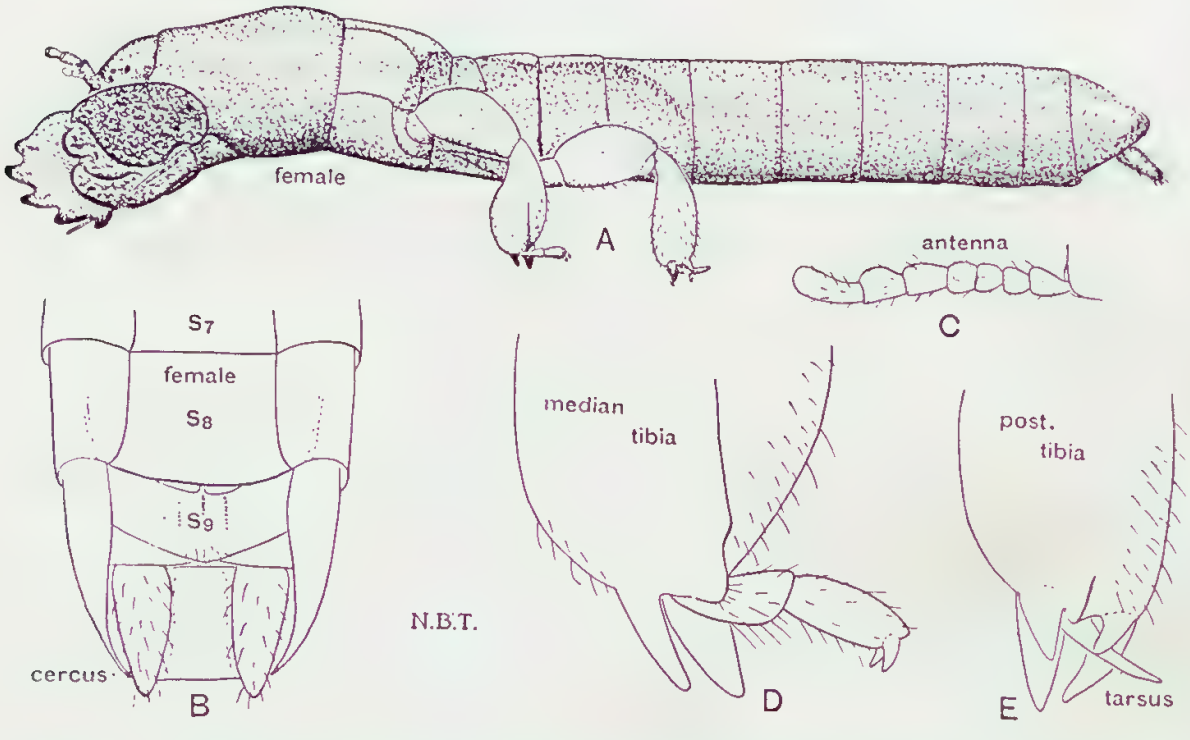

Fig. 12. *Cylindracheta psammophila* sp. nov. A, adult female; B, ditto, apex of abdomen beneath; C, antenna; D, apex of median tibia and tarsus; E, apex of posterior tibia and tarsus.

♀ Similar to male but larger. Antennae more slender, seven-segmented. Pronotum slightly narrower, abdomen with dorsal groove absent; cerci long, and projecting beyond apex of abdomen; the ninth sternite three times as wide as long. Length, 48 mm.; pronotum, 10·5 mm.; breadth of pronotum, 8·3 mm.; cerci, 2·5 mm.

Loc. Western Australia: Swan River, near Perth (H. W. Davey), the type, a male, and allotype female, I. 14912, in South Australian Museum; Perth, one paratype male, K. 33721, in Australian Museum; Geraldton (E. Ashby, October, 1927).

The female example is very light in colour, and had probably only just passed through the final ecdysis when captured. The male in the Australian Museum collection is somewhat more elongate than the type. It is the example figured by Tillyard ([12]) under the name of *Cylindracheta kochi.*

This species lives in sandy country near water; it burrows just beneath the surface in search of food, just as do the species of *Gryllotalpa.* Mr. A. M. Lea informs me that on one occasion, when digging up a peach tree in sandy country near Perth, he met with burrows and several individuals of this species in the sand.

Mr. E. Ashby recently picked up a single example, lying dead on the surface of a sandhill near Geraldton. The anal extremity had been mutilated and the thorax pierced, possibly by a bird. It is smaller than examples from the type locality, the ridge on the posterior tibia is slightly more developed, and the prothorax is less broad (index 77).

CYLINDRACHETA KOCHI Saussure.

Cylindrodes kochii Saussure, Melanges Orth., ii, 1877, p. 208, pl. ii, fig. 3; Saussure and Zehntner, Rev. Suisse Zool., ii, 1894, p. 428.

Cylindracheta kochii Kirby, Syn. Cat. Orth., ii, 1906, p. 7.

"Rufescens, nitida; pronoto pedibusque fimbriatis; oculis minutis, maculis 2 flavis ocellaribus; antennis brevissimis; femoribus 2*is* 3*iis* apice *inermibus,* tibiis anticis angustioribus, margine postico arcuato, integro; tarso antico uni-articulato, reliquis biarticulatis; femoribus posticis paulo longioribus quam intermediis; abdominis segmentis 1*o,* 2*o* superne lamellari-compresso, tertio compresso, superne trigonali."

"Longueur du pronotum 9·5 mm.; largeur du pronotum 6·4 mm."

"*Habite:* La Nouvelle-Hollande (Musée de Genève)."

Professor Dr. A. Reichensperger has kindly examined Saussure's type material, and has supplied the following note: "I am sending you some details about that ruined specimen in the Geneva Museum which is labelled *Cylindrodes kochii* Saussure. It must be the type; it is a pity Saussure never marked them! Of the antennae there is only one left, and this is sticky and dusty, surely repaired; it is impossible to tell how many articles there may have been; actually there are about six or seven, never eleven. On the hind legs there are no tarsi, they may be

([12]) Tillyard, R. J., Insects of Australia and New Zealand, 1926, pl. 7, fig. 12.

broken off; the single 'mobile spine' is not there. On the middle legs there is a two-jointed tarsus but no paired claws (if not broken away). There are no palpi left on the type. The *C. kochii* is further labelled 'Nord de la Nlle. Hollande.' There is another broken example in the collection, labelled '*C. campbelli ?* Gray, Swan River.' It looks just like the other ruin, but has two stout claws on the middle tarsus."

The type of *C. kochi* was unique. Saussure stated (in the explanation to his figure) that the posterior tarsi were missing, but in the text makes several statements, regarding them and other appendages, some of which are seemingly contradictory. In defining his group Cylindrodites, for instance, he says: "Pattes des deux autres paires tres courtes, ... *leurs tarses biarticulés*" (the italics are mine). In the generic description he says: "Tarses des 2e et 3e pairs courtes, *composés de 1 ou 2 articles,* et terminés par une griffe unique." Under the specific heading he says, however, "tarso antico uniarticulato, *reliquiis biarticulatis*"; and again: "Tibias des deux paires à peu près egaux. *Tarses composés de 2 articles.*"

As indicated in the second of the above quotations, Saussure says that the median tarsi have only a single terminal claw. The antennae are said by him to be eleven-segmented, "composées de onze articles," although his figure shows only about seven. An apparent tenth abdominal tergite is indicated in dotted outline in his figure.

One is inclined to doubt the correctness of some of the above statements, but since Giglio-Tos has recently said that in his Patagonian species also the median tarsi have only a single claw, Saussure's observations on this point, for instance, may be correct. As all three species before me have seven-segmented antennae, two-segmented median tarsi with paired terminal claws, one-segmented posterior tarsi without claws, and viewed from above only nine apparent abdominal segments, Saussure's statements are open to criticism. Even if *C. kochi* is proved to have had similar appendages to those of the examples before me, the description and figure agree so little with them that we may at present safely venture to regard it as a little known and improperly described species whose habitat is "Nord de la Nlle. Hollande."

The second (Swan River) example mentioned by Dr. Reichensperger is evidently the one described and figured some years later by Saussure and Zehntner ([13]), who in a footnote suggest that it may be *C. campbelli.* The presence on both the median and posterior tibiae of a smooth ridge or lobe (as stated by them) indicates that it is probably an example of *C. arenivaga;* an

(13) Saussure and Zehntner, l.c. p. 429, pl. xvi, figs. 17-19.

examination of the specimen would, however, be necessary for certain identification. The pronotum of the type of *C. kochi* is comparatively long and slender (length-breadth index 67), and in this character comes nearest to examples of *C. arenivaga*.

CYLINDRORYCTES gen. nov.

Cylindracheta Giglio-Tos, Ann. Mus. Civ. Stor. Nat. Genova, xlvi, 1914, p. 83 [part].

Antennae shorter than length of head, moniliform, composed of seven segments in the male and eight segments in the female. Eyes elliptical, minute, depressed. Ocelli absent. Pronotum cylindrical. Mesothorax separated from prothorax by a gracile collar (much constricted), which permits of extreme mobility between the two segments. Anterior tarsi composed of two segments. Median tarsi two-segmented with a single claw. Posterior tarsi one-segmented with very small paired claws or apical projections.

Genotype: *C. spegazzinii* Giglio-Tos.

CYLINDRORYCTES SPEGAZZINII Giglio-Tos.

Fig. 13.

Cylindracheta spegazzinii Giglio-Tos, Ann. Mus. Civ. Stor. Nat. Genova, xlvi, 1914, pp. 81-101, pl. i, figs. 1-11.

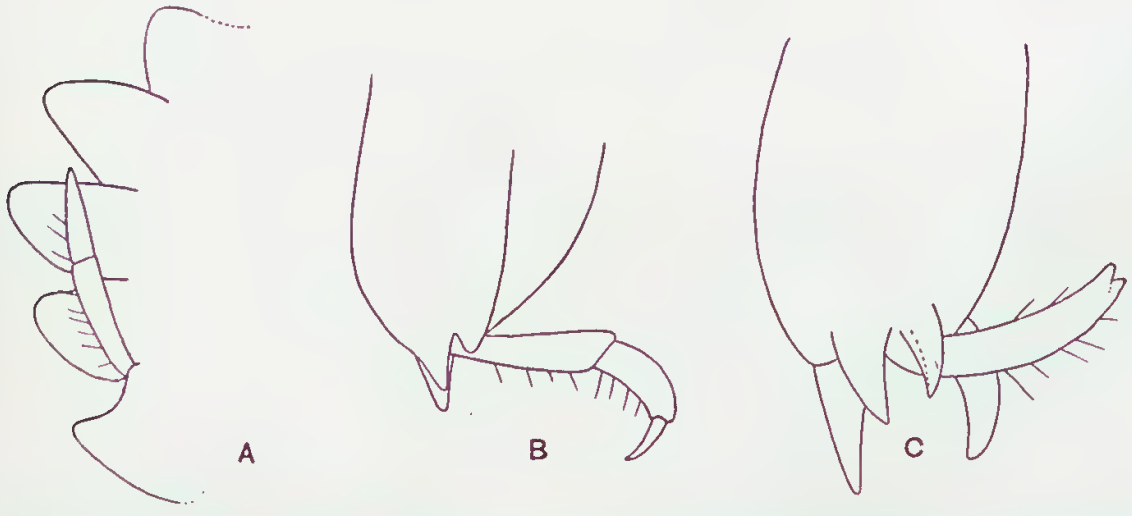

Fig. 13. *Cylindroryctes spegazzinii* Giglio-Tos. A, dactyls of anterior tibia, and tarsus; B, apex of median tibia and tarsus; C, apex of posterior tibia and tarsus. (Retraced from pencil sketches by M. L. Chopard.)

This remarkable cricket was discovered by Professor C. Spegazzini on the sandy shores of Lake Nahuel Huapi, in Patagonia, at an altitude of 2,530 feet (71° west long. x 41° south lat.). In addition to the type pair two further examples have been taken, on the Rio Nequen, and are in the collection of M. L. Chopard.

The generic diagnosis has been drawn up from the detailed description by Giglio-Tos, which occupies twenty-one pages. The example regarded as a male by him is undoubtedly a female, and *vice versa*. The terminal segments of the abdomen, as figured by him, appear very different from all the Australian species, but the copulatory hooks on the paraprocts of the tenth sternite have their parallels in the males of species of *Cylindracheta*. The ninth sternite of the female is twice as long as wide in the Patagonian species, whereas in the Australian forms it is usually wider than long.

I am indebted to M. Chopard for the accompanying figures showing details of the tarsi. He has also kindly supplied the following comments: "The anterior tarsus is very neatly two-jointed; the median tarsus bears only one claw, and the same tibia no posterior spur, such as is shown in your sketch [of *Cylindracheta arenivaga, vide* fig. 8 B]; the posterior tarsus bears two very small claws at the apex."

Subfamily Tridactylinae.

Only one genus is known to occur in the Australasian region; comments are therefore made under the generic heading.

TRIDACTYLUS Olivier.

Tridactylus Olivier, Encyclopedia Méth., Ins. iv, 1789, p. 26; Serville, Ins. Orth., 1839, p. 311; Saussure, Mém. Soc. Genève, xxv, 1877, p. 44; Saussure and Zehntner, Rev. Suisse Zool., ii, 1895, p. 411; iv, 1896, p. 407; Kirby, Syn. Cat. Orth, ii, 1906, p. 8 (full synonymy).

Xya Latreille, Gen. Crust. Ins., iv, 1809, p. 383.

Heteropus Palisot de Beauv., Ins. Afr. Amér., 1805, p. 231.

Type: *Tridactylus digitatus* Coq., W. Africa.

Some forty species of the genus have been described from subtropical and tropical America, Africa, Europe, and Asia. Some of them are separated by colour alone, and obviously inaccurate statements appear to have been made regarding the structure and armature of others. Even in the European *T. variegatus* one cannot learn from the various figures and descriptions the correct numbers of lamellae on the posterior tibiae (actually there are four external and three internal marginal ones). Some of the earlier described Asiatic species are probably composite, or the names are applied indiscriminately to several closely allied forms.

Several characters quite useful for specific separation have been apparently unobserved, and the value of others discounted. On the lower internal margin of the anterior femora in all of the species examined by me there is present a set of semi-transparent specialized spines arranged to form a comb.

Often, as in *T. variegatus*, the spines are simple, flattened and grouped in pairs, but in at least one species (*T. inflata* Brunn., Sumatra) they are very broad, flattened, and partly bisected to form series of two-pronged forks. Contrary to what has been stated by some other authors, the presence or absence of wings appears to be quite a constant character, in many species, and one useful, within limits, for specific separation.

The proportions of the appendages are important. They were mounted in Canada balsam, and measured with an eye-piece micrometer. The lengths of the whole insects are measured from the anterior extremity of the head to the apex of the abdomen, exclusive of the appendages.

The species of this genus live in the banks of streams and lagoons, where they hollow out tunnels at the water's edge. They travel with great agility over the surface of the water, and are even capable of diving beneath the surface. For swimming purposes seven broad, flat, articulated, paddle-like flanges or lamellae are developed on the posterior tibiae.

Auditory and stridulating organs have not been previously noted in members of this subfamily. The Asiatic and Australian species of the genus *Tridactylus* may, however, be divided into two groups, based on the presence or apparent absence of these organs, a preliminary account of which is given herewith.

The species of the *T. variegatus* group (*variegatus, japonicus, mutus*, etc.) are dumb, but others, such as *T. inflata* and its allies, and two new Australian species described in this paper, possess (on the apical part of the elytra) a strigil similar in appearance to that developed in *Gryllotalpa*. A specialized organ (probably auditory in function) is developed on the dorsal surface of the apparent first segment of the abdomen. It consists of a broad, sub-rectangular membrane, stretched between anterior and posterior transverse chitinous ridges. In *T. musicus* it is three-fourths as long as the prothorax. The scantiness of my material has up to the present precluded a detailed examination of the structure.

KEY TO AUSTRALIAN SPECIES OF TRIDACTYLUS.

A. Metatarsus much shorter than superior apical spurs of posterior tibiae .. .. *mutus*

B. Metatarsus as long as or longer than superior apical spurs.

a. Posterior tibiae with one external and two internal (*i.e.*, 1 + 2) marginal serrations .. .. .. *tantillus*

b. Posterior tibiae with three external and four internal (3 + 4) marginal serrations .. .. .. *musicus*

c. Posterior tibiae "with two small obtuse teeth" (Mjöberg) .. .. *australicus*

With the increase of our knowledge of these minute crickets the numbers of serrations on the posterior tibiae may be found to be variable. In *T. mutus* the males appear to have 4 + 4 serrations, whereas the females possess 4 + 5.

TRIDACTYLUS MUTUS sp. nov.

Fig. 14.

♂ Head, prothorax, and posterior femora dark green. Head with antennae short, stout, and moniliform, cupreous-green, clothed with fine pubescence, first segment stout, second moderate, third longer than second and any of the following except the apical (tenth) one, which latter is somewhat swollen and elongate-ovate; labrum transverse, anterior margin well rounded; clypeus narrowly transverse; ocelli, three, small but conspicuous; eyes large, projecting, sub-angulate, upper margin bordered by a pale whitish fascia; vertex smooth with a few scattered punctures. Prothorax transverse, one-sixth wider than long, smooth, sparsely punctured, dark green with cupreous reflections, except for a whitish triangular area at postero-lateral angle. Abdomen dark brownish-green beneath brown, posterior margin of each sternite whitish, giving abdomen a transverse banded appearance, anal appendages brown, apical sternite (ninth) as long as or longer than wide, the hind-margin well rounded. Elytra twice as long as wide, extending only to middle of length of abdomen, obliquely rounded at apex, opaque dark brown, the whole surface covered with minute fish-scale like impressions. Wings obsolete, when in repose scarcely protruding beyond elytra. Anterior legs with femora armed on inferior internal margin with a fine comb of about fifteen specialized spines: tibiae armed with four dactyls and a row of stout hairs, long on the anterior margin and short on the posterior; tarsi two-segmented, the first incompletely divided by an inferior groove. Median legs with tibiae moderately stout, tarsi two-segmented, first segment deeply constricted and furnished with semi-transparent pads beneath. Posterior legs with femora extending beyond apex of abdomen; tibiae strongly curved, with eight serrate projections on upper margins, four external and four internal, armed also with seven subapical lamellae, four external and three internal, the latter ones larger and broader than the others; two superior subapical spines and two inferior apical ones are also present, the former pair one-third the length of the latter; metatarsus composed of a single obsolete sub-spherical segment one-third the length of the subapical spines. Length, 4·0 mm.; of pronotum, 1·1 mm.; breadth of pronotum, 1·3 mm.; length of elytra, 1·5 mm.; of posterior femora, 2·8 mm.

♀ Similar to male, but larger. Eighth sternite of abdomen notched on posterior margin; ninth sternite with median longitudinal impressions. Posterior

tibiae armed with four external and five internal marginal serrations. Length, 5·1 mm.; of pronotum, 1·5 mm.; breadth of pronotum, 1·7 mm.; length of elytra, 1·5 mm.; of posterior femora, 3·5 mm.

Loc. Queensland: Cairns district (F. P. Dodd); Brisbane (H. Hacker). New South Wales: Sydney (A. M. Lea); Woodford (A. J. Nicholson); Wallacia (H. M. Hale and N. B. Tindale, March, 1927); Condobolin; Howlong (W. W. Froggatt). South Australia: Murray River (F. R. Zietz); Highbury, near Adelaide (N. B. Tindale, December, 1923, type locality). Type (male) and allotype (female), I. 14936, in South Australian Museum.

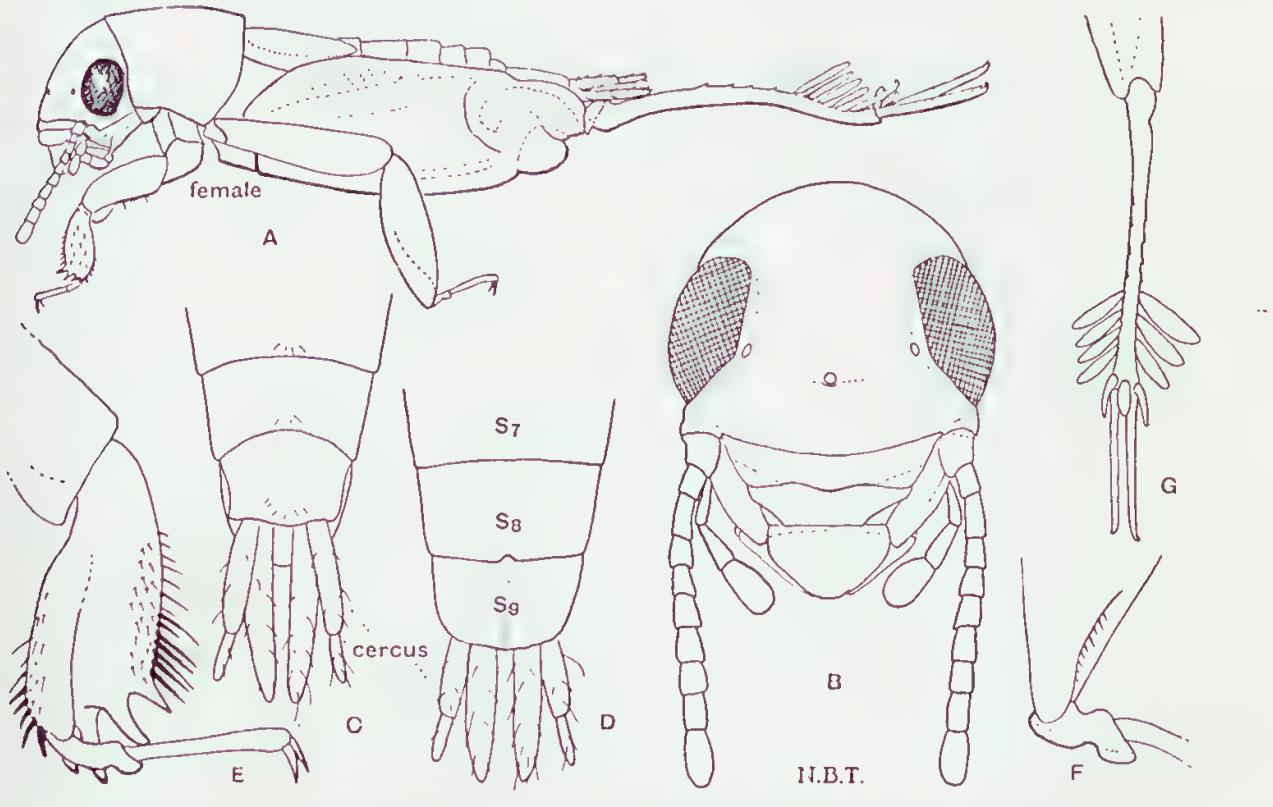

Fig. 14. *Tridactylus mutus* sp. nov. A, adult female; B, head; C, apex of abdomen above; D, ditto, below; E, left anterior tibia and tarsus, internal view; F, apex of median and first tarsal segment, internal view; G, left posterior tibia and tarsus, viewed from above.

The type examples were taken at dusk by sweeping vegetation at the edges of a swamp lagoon. Others were taken at Wallacia by throwing water against the sandy bank of the river; when washed out the creatures moved actively over the surface of the water and attempted to escape by digging into the bank at the water's edge. A single example was found adhering to the sticky seeds of *Pisonia brunoniana*, collected near Kuranda by Mr. F. P. Dodd. Little or nothing is known about the life history.

Some examples from Condobolin are more variegated in colour, and are slightly larger than the typical form. There are two curved whitish marks on

the posterior margin of the pronotum (near the middle line), and the posterior femora bear two short longitudinal marks and an irregular subapical whitish blotch. The abdomen beneath may be very light brown, with the whitish band on the posterior margins of the segments very broad. Structurally there appears to be little difference from the normal form.

Chopard (14) has identified examples from the Cairns district, probably of this species, as *T. japonicus*, from which species it is quite distinct.

Froggatt (15) has figured an example of *T. mutus* without detailed description, under the name of "*Nemobius* sp." Four internal marginal lamellae are shown on the posterior tibiae instead of three, otherwise the figure agrees with the specimens described above.

The median tibiae in this and the two following species contain a large oil gland, the product from which appears to be secreted on to the surface of the derm by numerous small pores, and serves, no doubt, to render the insects waterproof. (Fig. 15 E.)

TRIDACTYLUS TANTILLUS sp. nov.

Fig. 15.

♂ Head, pronotum, and elytra brown, darker laterally. Antennae pale brown with apex of each segment darker, pubescent, first segment moderately large, second to fourth decreasing in size, fourth only one-half length of eighth, fifth to seventh subequal, tenth the longest, cylindro-conical with blunt point; ocelli conspicuous; eyes large, hemispherical, coarsely faceted; vertex sparsely clothed with whitish pubescence. Pronotum nearly one-third wider than long, somewhat inflated, postero-lateral angle well rounded, lateral margin distinctly concave, wholly brown, very sparsely clothed with fine white hairs. Abdomen brown, beneath, especially at apex, paler; apical sternite strongly transverse, posterior margin well rounded, clothed with dense white pubescence; anal processes densely hairy; second segment of cerci slender, more than half length of first. Elytra (fig. 15 A) moderate, two and one-half times as long as wide, apex angulate, anterior margin strongly convex at base, three veins prominent, the subcostal one bears on its distal fourth a stridulating file composed of numerous transverse teeth (fig. 15 B). Wings present, long, when folded reaching to apex of cerci. Anterior legs with femora armed with a comb of fifteen semi-transparent, broad, flattened teeth; tibiae moderately clothed with coarse hairs and armed with four dactyls. Median legs with tibiae stout, tarsi

(14) Chopard, L., Arkiv för Zool., 18A, No. 6, 1925, p. 6.

(15) Froggatt, W. W., Australian insects, Sydney, 1907, pl. vii, fig. 4.

slender, first segment more than half length of second; second segment apparently capable of being bent into position of repose (fig. 15 E). Posterior legs with femora stout, not reaching extremity of abdomen; tibiae weakly curved, bearing on upper margins only three serrations (one external and two internal); armed with seven slender lamellae (four external marginal and three internal); Subapical paired spines distinctly hooked at apex, nearly one-half length of apical spines; metatarsus elongate; conical, as long as subapical spines, anterior margin regularly serrated, posterior margin with a row of fine hairs. Length, 3·6 mm.; of pronotum, 0·7 mm.; breadth of pronotum, 1·0 mm.; length of posterior femora, 2·3 mm.; of elytra, 1·5 mm.

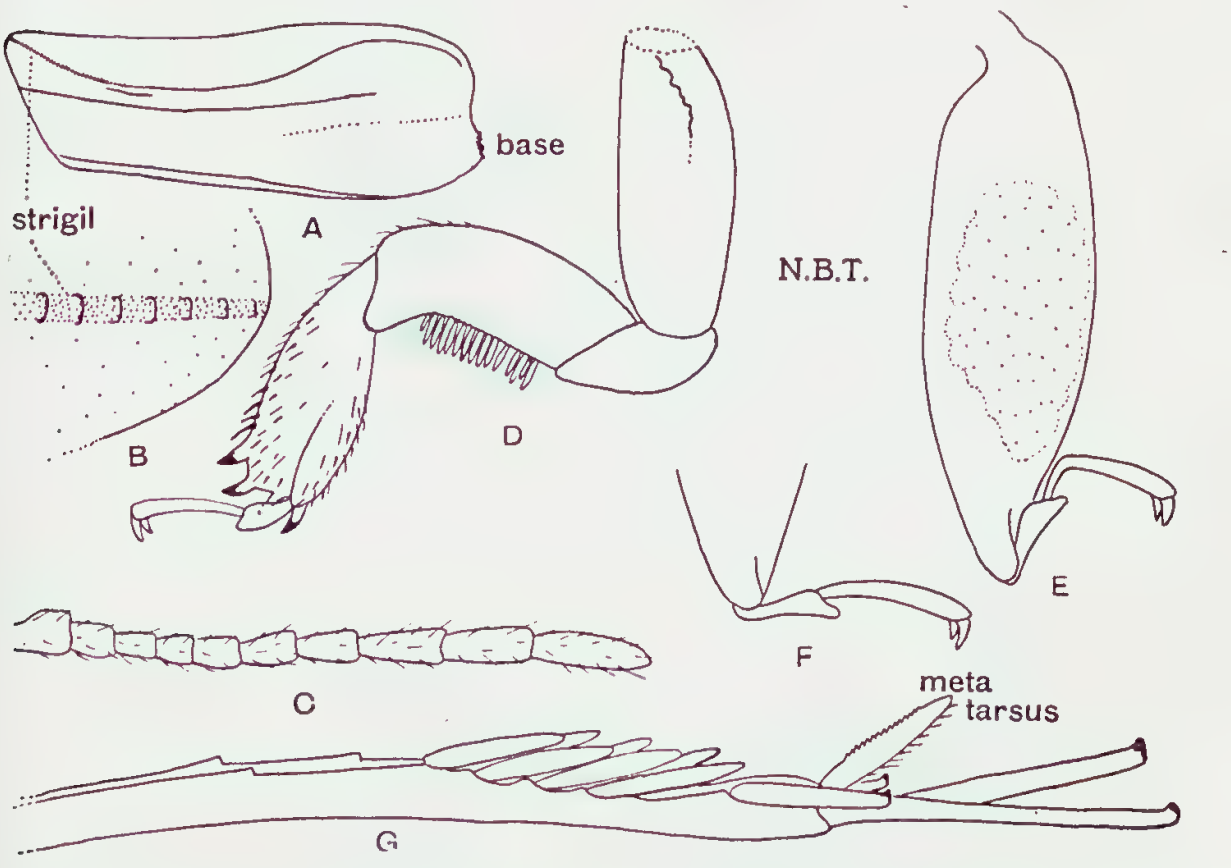

Fig. 15. *Tridactylus tantillus* sp. nov. A, elytron, viewed from beneath to show stridulatory teeth; B, ditto, part, greatly enlarged; C, antenna; D, right anterior leg, internal aspect; E, median tibia and tarsus, showing tarsus in position of repose; F, ditto, another position; G, apex of posterior tibia and tarsus, external aspect.

Loc. Northern Territory: Daly River (H. Wesselman). Type, unique, I. 14937, in South Australian Museum.

This species is smaller than *T. pulex*, the smallest species of the genus previously known, and differs from it in the presence of an elongate metatarsus.

TRIDACTYLUS MUSICUS sp. nov.

Fig. 16.

♂ Head, prothorax, and abdomen dark brown. Head with antennae pale brown, stout, finely pubescent; basal segment stout, second and third nearly as long as first, fourth the shortest, fifth and sixth as long as second, seventh and eighth subequal, together equal to three times length of fourth, apical segment (tenth) the longest; eyes moderate, ocelli rather large and conspicuous; vertex

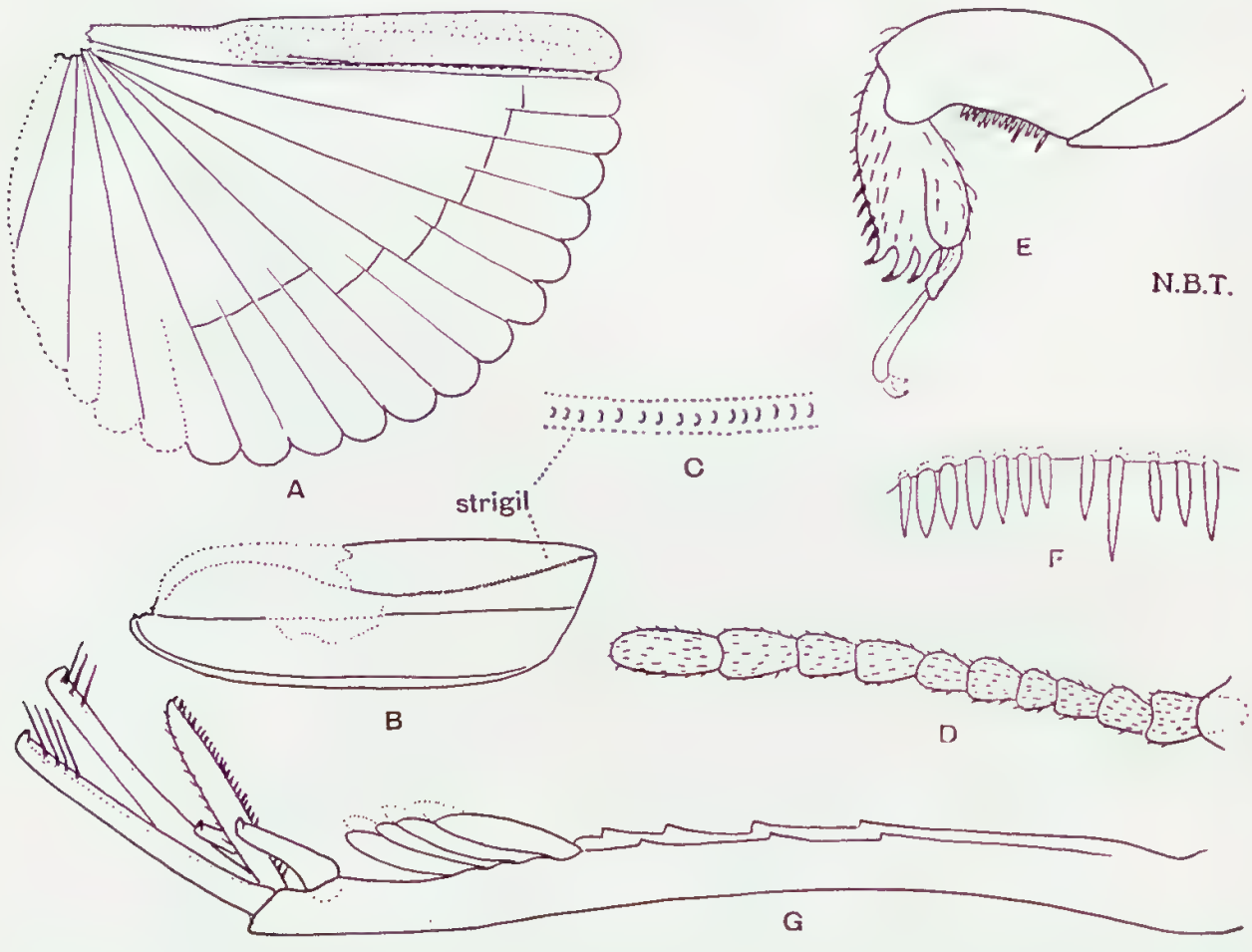

Fig. 16. *Tridactylus musicus* sp. nov. A, wing, the anal part indicated approximately; B, elytron, showing strigil, basal third of anterior margin broken away; C, part of strigil, greatly enlarged; D, antenna; E, right anterior femur, tibia and tarsus, showing femoral comb; F, femoral comb, greatly enlarged; G, apex of right posterior tibia and tarsus, external aspect.

smooth, with a few scattered hairs. Prothorax brown, with a slight metallic lustre; one-fourth wider than long, lateral margin concave, postero-lateral angle well rounded, the whole surface finely marked with tiny impressions, like fish-scales, and clothed with scattered whitish pubescence. Abdomen beneath pale brown; the apparent apical sternite transverse, posterior margin indistinctly angulate, sparsely clothed with whitish hairs; cerci with second segment slender,

nearly as long as first. A large sub-rectangular tympanum present dorsally on apparent first abdominal tergite. Elytra three times as long as wide, dark brown, with apex, part of costa, and a submarginal spot paler; apical three-sevenths of subcostal vein armed on inferior surface with a stridulatory file composed of many narrowly transverse teeth. Wings (fig. 16 A) present, moderate, in repose extending to apex of first segment of cerci, light brown, with the upper (not costal) margin fringed with hairs and marked with regular alternate paler bars, the fan transparent. Anterior legs light brown; base of coxa dark brown; femora armed with an irregular comb of twelve semi-transparent flattened teeth; tibiae rather densely clothed with coarse hairs, armed with four dactyls, the posterior one weak; apical half of anterior margin lined with stout hairs; tarsi with basal segment not constricted. Median legs with tibiae stout, dark brown, with postero-lateral margin irregularly whitish, tarsi two-segmented, second segment (as in *T. tantillus*) capable of being bent into position of repose. Posterior legs with femora brown; tibiae pale brown, with upper margins armed with seven serrations (three external and four internal), with seven lamellae (four external and three internal) and with two pairs of distal spines; the subapical ones moderate, the inner marginal one distinctly the longer, one-half as long as inner apical one, apical spines long, armed near apex with three or four regular stout hairs; metatarsus greatly elongated, one-fourth longer than inner marginal subapical spine, the anterior margin strongly serrated, the posterior margin lined with closely set hairs. Length, 4·4 mm.; of pronotum, 0·8 mm.; breadth of pronotum, 1·0 mm.; length of elytra, 1·7 mm.; of posterior femora, 2·2 mm.

Loc. Queensland: Normanton, Gulf of Carpentaria district (R. Kemp). Type, unique, I. 14938, in South Australian Museum.

Allied to *T. tantillus*, from which it differs in the more numerous serrations of posterior tibiae and in the enlarged metatarsus. The tympanum at the base of the abdomen is not quite as large as in *T. tantillus*, and the strigil on the elytra is longer but composed of weaker teeth.

TRIDACTYLUS AUSTRALICUS Mjöberg.

Tridactylus australicus Mjöberg, Ent. Tidskr., 1913, p. 31; Chopard, Ark. f. Zool., 18A, No. 6, 1925, p. 6.

The description of this species is short. The antennae are said to have the first seven segments of the same length, the eighth a little longer, the ninth still longer, and the terminal segment the longest. The posterior legs are said to have only two obtuse teeth or serrations anteriorly from the lamellae, and the

metatarsi are longer than the "upper spurs." The length is 5 mm., and the wings are fully developed.

Loc. North-west Australia: Kimberley (types). Queensland: Cape York (according to Chopard).

The description does not agree with any one of the three Australian species before me. In particular the proportions of the antennae are different and the numbers of serrations on the posterior tibiae are less. In *T. tantillus* the metatarsus is just as long as the superior apical spurs, and in *T. musicus* there are three external and three internal serrations instead of two, as in *T. australicus*.

SPECIES OF *CHLENIAS* ATTACKING PINES
(LEPIDOPTERA, FAMILY BOARMIIDAE)

BY NORMAN B. TINDALE, SOUTH AUSTRALIAN MUSEUM.

Text figs. 17 and 18.

A SPECIES of *Chlenias* was recently discovered attacking *Pinus insignis* plantations at Mount Burr, in the south-east of South Australia. This moth is being studied, from an economic aspect, by the Museum Entomologist (Mr. A. M. Lea) for the Woods and Forests Department.

The purpose of the present paper is to place on record a description of the species, which appears to be new, and to comment on the synonymy of some of its allies, at least one of which is also responsible for damage to pine trees.

CHLENIAS PINI sp. nov.

Figs. 17 B and 18 A-F.

♂ Antennae strongly bipectinate; pectinations at greatest six times the width of segment. Head and thorax brownish-black with scattered white scales; abdomen fawn-coloured. Forewings elongate, triangular, rather broad, costa almost straight, termen sinuate, dorsum straight, clothed with greyish- and silvery-white scales; with numerous blackish scales forming transverse bands; the first from one-fifth costa curves in an irregular half-circle to posterior margin at one-third, and is margined inwardly with white scales; a second line from one-half costa reaches hind-margin at one-half; a broad, irregular, blackish band from costa near apex extends to the anal vein at four-fifths, and is margined on each side with a line of white; some greyish scales usually divide this black band into two unequal parts, the smaller forming a well-defined subtornal spot. Cilia greyish-white. Hindwings dark grey, somewhat lighter at base, cilia as in forewings. Expanse, 48 mm.

♀ Antennal pectinations 2. Forewings more elongate than in male; darker in colour, markings as in male but much obscured. Hindwings narrower; dark grey, slightly lighter at base. Expanse, 48 mm.

Egg. Ovate, nearly smooth or very finely shagreened, hyaline; pale greenish in colour; in an advanced stage of development the colour becomes pale bronzy-grey, and the enclosed larva is visible in dark outline (fig. 18 A).

The empty shell is translucent, whitish with an opalescent sheen, the smaller end is eaten away by the larva prior to emergence (fig. 18 B). Length, ·84 mm.; breadth, ·57 mm.

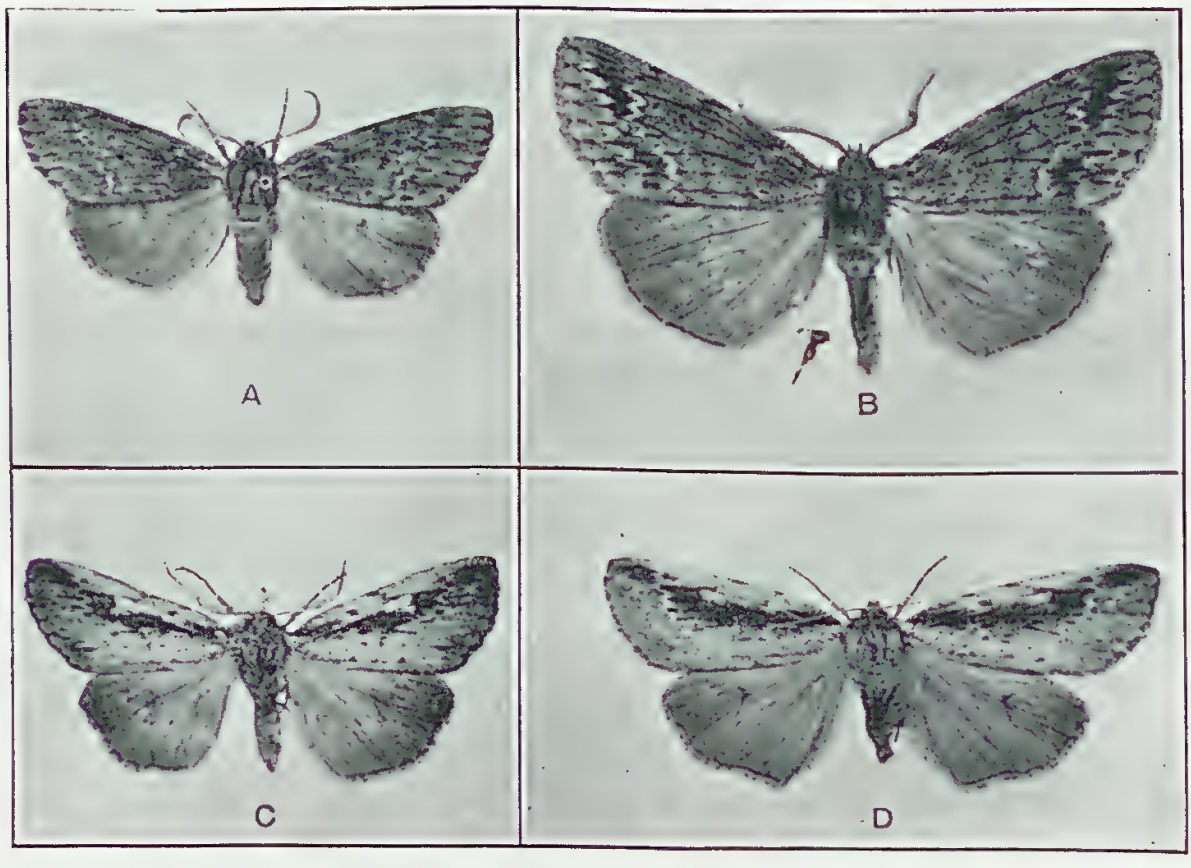

Fig. 17. A, *Chlenias zonaca* Guest, male; B, *Chlenias pini* Tindale, male; C, *Chleinas pachymela* Lower, male; D, *Chlenias pachymela* Lower, female.

Larva. The first instar larva (fig. 18 A) is velvety black, with cream lateral and a white median longitudinal stripe; with numerous small bluish-white spots on the velvety black intervening spaces. The head is ochreous-brown. Length, 2·0 mm. The adult larvae (fig. 18 D) vary from 27 mm. to 35 mm. in length. They are moderately stout, sub-cylindrical, and smooth, clothed with scattered hairs and marked with numerous longitudinal velvety-black, bluish-white, and orange-yellow stripes. Only two pairs of prolegs are present. The head and prothorax are slightly shagreened, bluish-green in colour, with scattered blackish marks and spots. The legs are dull purple, with the tips darker. There is a broad dorsal longitudinal orange stripe running from the mesonotum to the antepenultimate segment of the body, parallel to which are three, sometimes four, velvet-black irregular striae, alternating with broken bluish-white ones. Laterally from these there is a superior lateral orange line bordered below by a

broad black line. In a median lateral position there is a second broader and brighter orange-coloured stripe, interrupted on each segment by a spiracle marked in black and partly surrounded by a whitish suffusion. Between the two

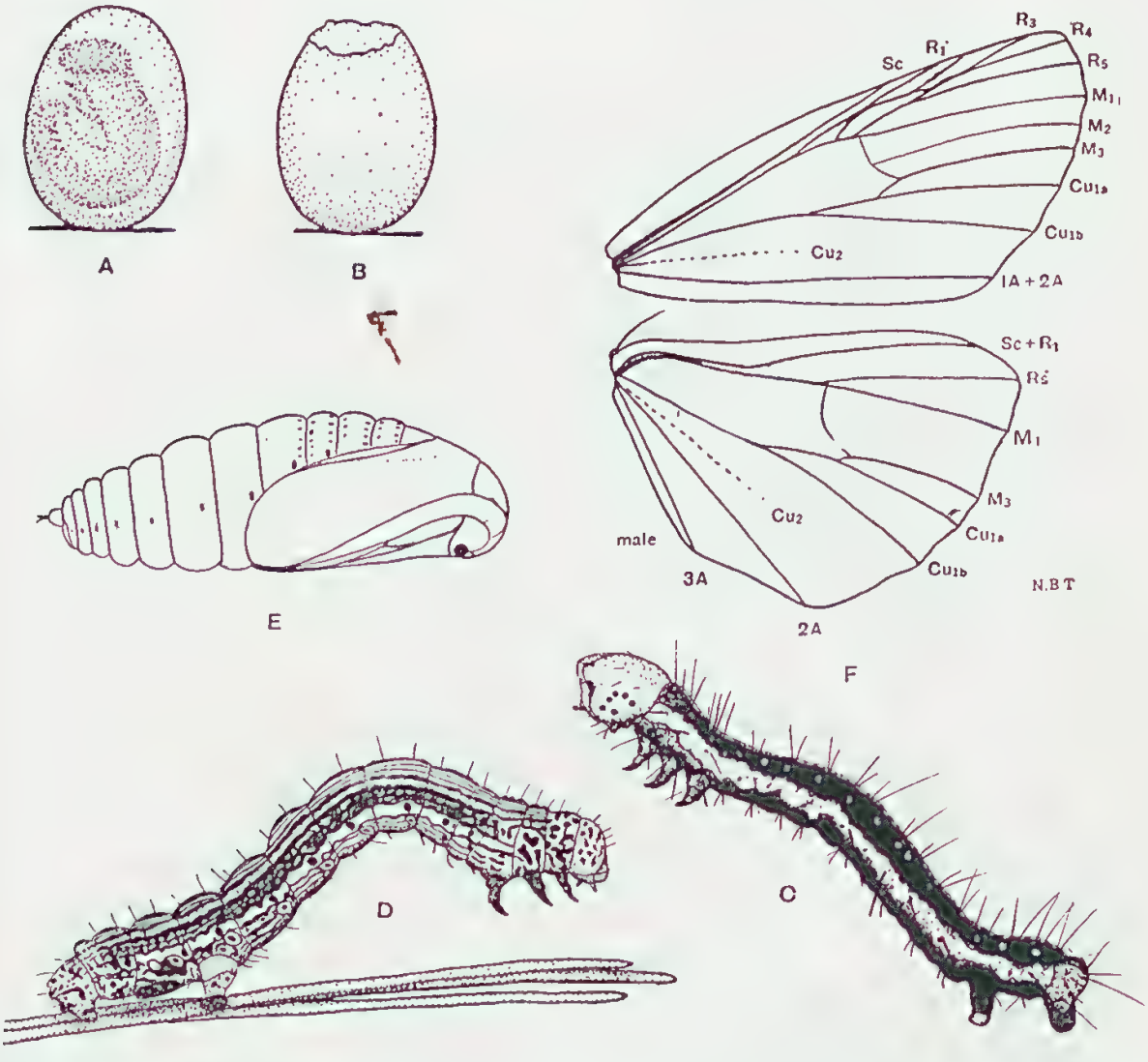

Fig. 18. *Chlenias pini* Tindale. A, egg with advanced embryo (× 3); B, egg shell; C, newly emerged larva (× 30); D, adult larva (× 2 approx.); E, pupa; F, wing venation of male.

orange stripes there are several rows of irregular black lines interspersed with numerous bluish-white hieroglyphic markings. Below the lateral orange stripe there are several lines of velvety-black alternating with white; the pattern of the upper-surface being repeated, except that the area between the first pair of prolegs and the anal extremity is broadly yellowish-green. There is a conspicuous ovate purple patch on the lateral surface of the body, above the first pair of prolegs; the latter are pale green, spotted with black. The anal segment is pale bluish-green, spotted with black.

Owing to the alternation of bluish-white, yellow, and black lines on the body the general colour of the larva appears to be green. The markings of a half-grown larva (12 mm. in length) are similar to those of adult ones.

Pupa. The pupa (fig. 18 E) is enclosed in an oval cocoon of sand, cemented together with silk, or more rarely of pieces of debris from the forest floor. The pupa is dark chestnut-brown, rather stout, smooth, and covered with fine punctures. The wing and antennal coverings are marked with numerous delicate striae, and the four basal abdominal segments bear two dorsal transverse series of deep punctures. Length, 18 mm.

Loc. South Australia: Mount Burr. Type, a male, and allotype female, I. 18313, in South Australian Museum, reared, June, 1928, at Adelaide, from pupae collected by Mr. A. M. Lea in December, 1927.

A female example and several males were taken by Mr. F. Kay at Mount Burr on May 26. About two hundred males and a dozen females emerged in our breeding-boxes during June and July, most of the females appearing during the second and third weeks of the former month. Their adult life is short. A female mated the evening after emergence laid 79 eggs the following night, and was dead on the fifth evening. An examination of some hundreds of pine-needles, which were covered with eggs from end to end, shows that females probably lay normally from 100 to 360 eggs. Newly emerged larvae were obtained in July, and adult larvae and pupae in December. The pupal period extends for nearly six months; probably there is only one, a late autumn or winter brood of moths.

The species is closely allied to *C. zonaea* Guest, from which it differs in size, antennal pectinations, and markings. Guest's description of the larvae of *C. zonaea* differs in several particulars from those of *C. pini.*

Mr. G. Lyell informs me that he has had examples of *C. pini*, from Victoria, in his collection for some years, under the name of *C. zonaea* Meyrick. Even if Meyrick's description applies (in part, if not wholly) to this species, the name *C. pini* will replace *C. zonaea* Meyrick, which is preoccupied by *C. zonaea* Guest.

CHLENIAS ZONAEA Guest.

Fig. 17 A.

Chlenias zonaea Guest, Trans. Roy. Soc. S. Austr., 1886, p. 15; Meyrick, Proc. Linn. Soc. N.S. Wales, 1891, p. 665 (in part only ?).

In 1886 Guest published a "Classified list of the Geometers of Balhannah," and included in it descriptions of no less than eleven species (of which the present species is one) under Meyrick's *ms.* names. Although his descriptions are meagre, they are in a valid form, his type-specimens have been preserved,

and it is therefore unfortunately necessary that Meyrick's names, ten of which he subsequently published himself, should sink as synonyms of Guest's.

Guest's type (a male, I. 18207 in South Australian Museum, 38 mm. in expanse, reared from a larva feeding on *Aster*, at Balhannah, April 7, 1886) is figured (fig. 17 A) for comparison with the new species.

CHLENIAS PACHYMELA Lower.

Fig. 17 C and D.

Chlenias pachymela Lower, Trans. Roy. Soc. S. Austr., 1893, p. 162.

An example of this species was received from Mr. C. French, jun. It was reared from a larva feeding on a pine tree, in Victoria. The examples figured (fig. 17 C and D) are from Victoria (Lucas collection). Lower's type example, a male, was from Melbourne. Type, I. 18211, in South Australian Museum.

Loc. Victoria: Melbourne. Tasmania: Launceston (six males, four females).

OTHER SPECIES OF *CHLENIAS* REPRESENTED IN THE MUSEUM COLLECTION.

CHLENIAS MELANOXYSTA Meyrick.

Chlenias melanoxysta Meyrick, Proc. Linn. Soc. N.S. Wales, 1891, p. 663.

Loc. South Australia: Balaclava (April, 1891, Type, I. 18204, in South Australian Museum), Adelaide (June), Exeter (June), Murray Bridge. New South Wales: Broken Hill (May, *ex* Lower coll.).

CHLENIAS UMBRATICARIA Guenée.

Chlenias umbraticaria Guenée, Hist. Nat. Lep., x, 1857, p. 240; Meyrick, Proc. Linn. Soc. N.S. Wales, 1891, p. 664.

Loc. South Australia: Balhannah (March, April), Blackwood (May), Parkside (May, June). Victoria: Gisborne.

CHLENIAS BANKSIARIA Le Guillou.

Chlenias banksiaria Le Guillou, Rev. Zool., 1841, p. 257; Meyrick, Proc. Linn. Soc. N.S. Wales, 1891, p. 664.

Loc. South Australia: Henley Beach, Adelaide (June), Balhannah (March), Balaclava (April). Victoria: Caulfield. Tasmania: Launceston (May, June).

CHLENIAS SEMINIGRA Rosenstock.

Chlenias seminigra Rosenstock, Ann. Mag. Nat. Hist., (5) 16, 1885, p. 430; Meyrick, Proc. Linn. Soc. N.S. Wales, 1891, p. 666.

Chlenias psolina Turner, Proc. Linn. Soc. N.S. Wales, 1919, p. 401.

Loc. Victoria: Melbourne.

CHLENIAS SERINA Lower.

Chlenias serina Lower, Trans. Roy. Soc. S. Austr., 1900, p. 36.

Loc. New South Wales: Broken Hill (May 1, 1900, Type I. 18210, in South Australian Museum, also April, June, July).

CHLENIAS MELANOSTREPTA Lower.

Chlenias melanostrepta Lower, Trans. Roy. Soc. S. Austr., 1893, p. 161.

Loc. South Australia: Blackwood (April 7, 1892, Type I. 18212 in South Australian Museum).

CHLENIAS CYCLOSTICHA Lower.

Chlenias cyclosticha Lower, Proc. Linn. Soc. N.S. Wales, 1915, p. 477.

Loc. New South Wales: Broken Hill (June, Type I. 18216, in South Australian Museum).

CHLENIAS GONOSEMA Lower.

Chlenias gonosema Lower, Trans. Roy. Soc. S. Austr., 1893, p. 162.

Loc. Victoria: Toorak, near Melbourne (Type I. 18213, in South Australian Museum).

CRYPTORHYNCHIDES *(CURCULIONIDAE)* MOSTLY FROM AUSTRALIA

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As more becomes known of the Curculionidae of New Guinea and various Pacific islands, it is apparent that many genera supposed to be confined to Australia, New Guinea, or New Zealand, etc., are widely distributed. This is especially the case with the Cryptorhynchides, all the main divisions of which, with the exception of *Melanterius* and allied genera (which are almost confined to species of *Acacia*), are widely distributed, many of the genera occurring in New Zealand, Fiji, and as far west as the Malay Peninsula, as well as in Australia.

Mechistocerus (1).

The species of this genus may be distinguished from all others of the Cryptorhynchides (except *Aonychus*, which has very different tarsi) by the prosternum having supplementary processes behind the front coxae, the processes being vertical and forming parts of the walls of the pectoral canal; at first glance they appear to be parts of the mesosternal receptacle, but on separating the prosternum from the mesosternum their positions are at once apparent.

Mechistocerus multimaculatus sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with white, buff, and black scales; each large puncture of upper-surface with a seta, not rising above general level; under-surface and legs with more distinct ones.

Head with a deep and rather narrow interocular impression. Rostrum rather long, moderately curved; with fine ridges and partially concealed punctures to near antennae (which are inserted almost in middle), in front with minute punctures. Two basal joints of funicle subequal in length; club about the length of three preceding joints combined. Prothorax distinctly transverse; sides almost parallel on basal half, and then rounded and narrowed to apex, median carina distinct but not continuous; with large punctures, becoming smaller about apex, but largely concealed by clothing. Elytra distinctly wider than prothorax, base trisinuate, shoulders feebly clasping base of prothorax; with regular rows of large and rather distant punctures, in feeble striae about suture, becoming distinct on sides. Metasternum and two basal segments of

(1) Fauvel, Bull. Soc. Linn. de Normandie, vii., p. 159.

abdomen with large punctures, the basal segment slightly depressed in middle. Femora stout, strongly and acutely dentate. Length, 8–11 mm.

♀ Differs in having the rostrum slightly thinner, with shorter ridges and smaller punctures, and basal segments of abdomen gently convex in middle.

Queensland: Coen River (W. D. Dodd and H. Hacker), abundant. New Guinea: Bongu (F. Schneider).

A comparatively wide, multimaculate species, with erect setae completely absent from the elytral interstices. The majority of the scales are of a buff colour or pale brown, in some parts with a slight golden gloss; on the pronotum there are usually eight black spots in two transverse series, but they are sometimes partly conjoined to form irregular transverse fasciae, or they may even form longitudinal vittae, the median carina and its vicinity are usually glabrous, so that the space there also appears black; there are usually several whitish spots, but these are indistinct on some specimens, and absent from others; on each side (but invisible from above) there is a dark vitta. On the elytra the black spots are numerous and irregular, the white spots are fewer in number and also irregular in disposition, but there is always a pale spot on each shoulder. The femora and tibiae also have black markings. The head when at rest is seen to be glabrous at the base, with small granules and fine transverse striae, but when the rostrum is partly extended the glabrous part is concealed by the apex of the prothorax. The median carina on the pronotum is always distinct, but is less acute and shorter on some specimens than on others. The elytra, when viewed from behind, appear cordate, owing to the disappearance of the latero-basal sinuations. On abrasion most of the punctures are seen to be large and deep. In general appearance the species is certainly close to *M. calidris*, but the many specimens taken all differ from that species in the same way. On each elytron of *calidris* there is a pale spot near the scutellum, beyond this there is often (but not always) a small dark spot, then an irregular, curved, pale fascia (commencing on the shoulder), then a fairly large black spot or cluster of spots (always present but variable), then an irregular pale fascia crowning the apical slope, then some small blackish spots, and at the apex itself another pale spot. On *M. dispar* there is a black blotch or irregular fascia about the middle, but the rostrum of the female is conspicuously longer; on *M. similis* the clothing of the abdomen is very different. The absence of interstitial setae distinguishes the species from *M. marmoreus*.

MECHISTOCERUS MAGNIDENS sp. nov.

♂ Black, antennae and tarsi reddish; rest of legs and part of rostrum obscurely diluted with red. Rather sparsely clothed with scales and setae.

Head with crowded punctures; with a deep and narrow interocular impression. Rostrum rather long, sides dilated near base, but notched at base itself; with ridges and squamiferous punctures on basal two-fifths, elsewhere with small, naked punctures. Antennae thin, inserted about two-fifths from apex of rostrum. Prothorax moderately transverse; with crowded but sharply defined punctures, and a feeble remnant of a median carina. Elytra much wider than prothorax, base feebly trisinuate, shoulders not clasping prothorax; with rows of large, oblong punctures, close together on basal half, but becoming smaller, more rounded and distant posteriorly. Metasternum with fairly large punctures, and a deep median groove. Basal segment of abdomen depressed in middle, it and the second segment with rather sparse punctures, smaller than on metasternum, fifth segment and sides of third and fourth with crowded punctures. Femora stout, strongly and acutely dentate, tibiae long and thin. Length, 5–6 mm.

♀ Differs in having the rostrum thinner, ridges and squamiferous punctures occupying a smaller basal space, antennae inserted nearer the middle and basal segment of abdomen rather strongly convex, with more sharply defined punctures.

Queensland: South Johnstone River (H. W. Brown).

In general appearance somewhat like *M. cancellatus* on a small scale, with brighter and sparser clothing, but punctures of metasternum somewhat smaller, those of second segment of abdomen much less numerous, and elytra less parallel-sided. The nontuberculate apex of the sides of the metasternal groove at once distinguishes from the male of *M. metasternalis*. The legs are longer and the femoral teeth stronger than on *M. duplicatus* and *M. egens*. The abdominal punctures are more numerous and smaller than on *M. punctiventris*, and the femora are stouter, with much larger teeth. The rather sparse clothing on the upper-surface is almost brick-red, becoming whitish on the under parts. On the pronotum it consists of a seta in each puncture; on each elytron there is a narrow spot on the third interstice at the base, and the preapical callus is well marked, elsewhere the clothing forms numerous ill-defined fasciae, in places slightly obscuring the punctures; there are numerous pale and dark setae, very distinct from the sides, and forming a row on each interstice. The tooth on each front femur is moderately large, on the middle ones somewhat larger, but on the hind ones much larger; being almost as large as the apical segment of abdomen. Except on the sides, and then but feebly, the elytral punctures are not placed in striae.

MECHISTOCERUS INTEROCULARIS sp. nov.

Black, antennae reddish. Clothed with more or less dingy setae, the elytra in addition with muddy-brown and obscurely whitish scales.

Head with crowded, partially concealed punctures; with a transverse interocular depression, in which is a feeble longitudinal impression. Rostrum slightly longer than prothorax, thin and parallel-sided, with fine ridges and coarse, setiferous punctures on basal third, beyond this with distinct naked punctures, becoming smaller to apex. Antennae inserted slightly nearer apex than base of rostrum, club as long as the four preceding joints combined. Prothorax moderately transverse, sides feebly dilated from base to beyond the middle, and then rapidly decreasing in width to apex; with rather large, crowded punctures, and a narrow median carina. Elytra moderately long, sides parallel to about the middle, base rather strongly trisinuate; with rows of large, deep, oblong punctures to beyond the middle, when they become smaller and rounded. Metasternum and basal segment of abdomen with coarse, crowded punctures, larger than on prothorax, second segment with somewhat smaller ones, apical segment with crowded ones, the third and fourth each with a single row. Front and middle femora moderately, the hind one largely and acutely, dentate. Length, 6·0–6·5 mm.

Queensland: Coen River (H. Hacker), Claudie River (J. A. Kershaw).

The interocular space is depressed, so that from the sides there is a distinct notch at the junction of the head and rostrum; this is at once distinctive from *M. basalis, cancellatus, metasternalis,* and similar species; it is much as on *M. duplicatus,* but the elytra are more sparsely clothed, with several irregular patches of whitish scales, and with longer and more erect setae; the pronotum is also carinated from base to apex. *M. punctiventris,* with similar base of rostrum, has very different abdominal punctures. The punctures on the basal half of the elytra are very large, and the interstices, both between the punctures and the rows, are very narrow, on the sides only they are in feeble striae. The clothing on the two specimens is in poor condition, but the species is a distinct one by the interocular space and the abdominal punctures. Judging by the rostrum they are probably both males. The Claudie River specimen has the apex of rostrum reddish.

MECHISTOCERUS SUBGLOBICOLLIS sp. nov.

Dark brown, rostrum somewhat paler, antennae pale red. Densely clothed with scales varying from whitish, through stramineous to dark brown, and distinctly mottled on the elytra.

Head with crowded, almost concealed punctures; between eyes with a rather narrow elliptic depression, with a narrow median line. Rostrum feebly curved, about base with short ridges, and coarse, squamiferous punctures, elsewhere with rather small, but sharply defined, nude punctures. Antennae inserted almost in middle of rostrum, second joint of funicle distinctly longer than first; club

rather elongate. Prothorax about as long as the basal width, sides strongly rounded in middle; with crowded, partly concealed punctures, and a feeble median carina. Elytra narrow and parallel sided to near apex, base feebly trisinuate, and distinctly wider than prothorax; with rows of punctures of moderate size, the interstices with crowded, concealed ones. Under-surface with crowded, partly concealed punctures; two basal segments of abdomen large, third and fourth each almost as long as the fifth. Femora moderately dentate, tibiae comparatively short. Length, 7 mm.

Queensland: Mount Tambourine, in December and January (H. Hacker and A. M. Lea).

A narrow, cylindrical species, allied to *M. cylindricus* and *M. vulneratus;* from the former it is distinguished by its less uniformly clothed elytra, and from the latter by the considerably smaller cephalic impression, and smaller and denser punctures on the metasternal episterna; a specimen of *vulneratus,* from Cooktown, approaches its clothing in colours, but has the cephalic impression of normal size. There are no erect setae on the elytra, but about the apex there are some setae pressed flat amongst the scales; the palest scales on the elytra are about the punctures, those of other shades are irregularly distributed; on the pronotum the clothing consists of stramineous and dark brown scales, or stout depressed setae, one in each puncture; on the legs the clothing is almost uniformly buff. The compound interocular impression, and the crowded punctures of the third and fourth abdominal segments, are unusual features in the genus.

MECHISTOCERUS SETIVENTRIS sp. nov.

Black, apical half of rostrum, antennae, and tarsi obscurely reddish. Densely clothed with variegated scales and setae.

Head with a narrow interocular impression, slightly dilated in front. Rostrum slightly longer than prothorax, evenly curved; basal fourth slightly dilated, with fine ridges and series of coarse, setiferous punctures, elsewhere with small, naked ones. Antennae inserted slightly nearer apex than base of rostrum. Prothorax slightly wider than long, sides very feebly dilated from base to beyond the middle, and then rapidly narrowed to apex, punctures normally concealed, except on basal sides, where they are large. Elytra distinctly wider than prothorax, sides parallel to about the middle, base trisinuate; with rows of large, partly concealed punctures, becoming smaller posteriorly. Metasternum with fairly large and dense punctures, and with a rather narrow median groove. Basal segment of abdomen with smaller punctures (except for a basal row) than on metasternum, third and fourth each with a row of setiferous ones. Front femora feebly, middle ones moderately, hind ones rather strongly dentate. Length, 6·5 mm.

New South Wales: Styx River, on sassafras (W. W. Froggatt); unique.

A prettily variegated species, structurally fairly close to *M. duplicatus*, but with longer and thinner legs, and different punctures of under surface. On the upper surface most of the scales are of a rather dingy brown, varying to fawn, but with fairly numerous irregular black spots on the elytra; in addition, there are some small irregular white spots, so placed as to form a feeble median V. On the pronotum the setae are dense but subdepressed; on the elytra they are fewer in number, but suberect and placed in a single row on each interstice. On the head and legs the scales are mostly brick-red, with numerous whitish setae. On the metasternum and abdomen there are no scales, but a few brick-red setae and numerous black ones; the latter on the abdomen are suberect and very conspicuous. On the disc of the pronotum the punctures are entirely concealed, and the clothing entirely conceals a feeble median carina. The basal segment of the abdomen is feebly convex in the middle, but judging by the rostrum the type may be a male.

MECHISTOCERUS PUNCTIPENNIS sp. nov.

♀ Black, antennae reddish, parts of rostrum and of tarsi more obscurely so. Moderately densely clothed with dingy brown and sooty scales; each prothoracic puncture with a suberect seta, slightly raised above general level, each elytral interstice with a row of suberect setae, very distinct from the sides; under-surface and legs with moderately dense scales and setae.

Head with crowded, concealed punctures in front, base glabrous; with a deep and rather narrow interocular impression. Rostrum slightly longer than prothorax, moderately curved; basal fourth with fine ridges and coarse squamiferous punctures, elsewhere with minute, naked punctures. Antennae inserted slightly nearer apex than base of rostrum. Prothorax almost as long as the basal width, sides feebly rounded and decreasing in width from base; with large, partly concealed punctures, becoming smaller in front; and with a feeble median carina. Elytra distinctly wider than prothorax, sides parallel to about middle, base feebly trisinuate, shoulders scarcely clasping prothorax; with rows of large, deep, oblong punctures, becoming smaller posteriorly. Metasternum and parts of abdomen with large, partly concealed punctures; second segment slightly longer than third and fourth combined. Femora stout, and, especially the hind ones, strongly and acutely dentate; tibiae long and thin. Length, 6 mm.

Malay Peninsula: Kuala Lumpur (A. M. Lea); unique.

With the general outlines of *M. calidris*, but less densely clothed, prothorax scarcely transverse, and elytra with larger, deeper, and more oblong punctures closer together; most of them are double or semi-double, but with only one seta

(on the anterior end); on the sides and posteriorly the punctures are in rather feeble striae. The shades of colour of the scales are ill-defined. The prothorax and head are conjointly subconical.

MECHISTOCERUS ZICZAC sp. nov.

♂ Black, antennae and parts of legs obscurely reddish. Irregularly clothed with brown and sooty scales and setae.

Head with dense punctures, and a rather narrow interocular impression. Rostrum scarcely the length of prothorax, slightly curved, with distinct ridges alternated with rows of squamiferous punctures on basal half, small but fairly distinct naked punctures in front. Antennae inserted about two-fifths from apex of rostrum. Prothorax about as long as wide, sides feebly diminishing in width, and slightly rounded from base to near apex, and then more strongly to apex itself; with crowded punctures and a very feeble median carina. Elytra rather long, not much wider than prothorax, parallel-sided to beyond the middle, base almost truncate, shoulders not clasping prothorax, with rows of moderately large, oblong punctures, much narrower than interstices, on sides and posteriorly in distinct striae. Metasternum and parts of abdomen with punctures about as large as on prothorax, basal segment flat in middle, second as long as third and fourth combined, each of these with a row of setiferous punctures across middle, but irregular on sides. Femora (for the genus) rather feebly dentate, tibiae comparatively stout. Length, 6 (vix) mm.

Malay Peninsula: Kuala Lumpur (A. M. Lea); unique.

With general outlines somewhat as on the preceding species, but with smaller punctures on prothorax and elytra, and femora much less strongly dentate, the front pair appearing edentate from some directions. Each prothoracic puncture contains a scale, but many of these do not rise to the general level; on the elytra the dark scales are scarcely distinguishable from the derm, but the paler ones form numerous irregular or zigzag asymmetrical fasciae; each interstice has a row of small setae, but they are very indistinct on the basal half. The legs have dense scales and fine setae. The ridges on the rostrum are unusually distinct, but are certain to be shorter in the female. The elytral interstices, where not concealed by clothing, are seen to be finely shagreened. From directly above the large elytral punctures appear to have a small setiferous basal granule, but from behind this appearance is lost, although the setae are distinct.

MECHISTOCERUS CARBO sp. nov.

Deep black, antennae and tarsi obscurely reddish. Rather sparsely clothed. Head with crowded, opaque punctures in front, smaller and subgranulate

about base, with a narrow interocular impression. Rostrum slightly longer than prothorax, moderately curved; with sharply defined ridges, alternated with coarse, setiferous punctures on basal half, with minute naked punctures elsewhere. Antennae inserted slightly nearer apex than base of rostrum. Prothorax about as long as wide, sides rather strongly rounded, apex about two-thirds the width of base; punctures crowded and fairly large, becoming small in front, median carina very feeble. Elytra rather long, much wider than prothorax, parallel-sided to beyond the middle, base scarcely trisinuate; with rows of fairly large, deep, oblong punctures, becoming enclosed in narrow striae posteriorly and on the sides. Metasternum with punctures much as on prothorax. Abdomen with comparatively small, shallow punctures, but crowded on apical segment; basal segment flattened in middle, with a narrow, deep, angular impression. Legs rather long, femora (especially the hind ones) strongly and acutely dentate. Length, 5 mm.

Malay Peninsula: Kuala Lumpur (A. M. Lea); unique.

A jet-black species. The basal spots on the elytra are somewhat as on *M. basalis* (a Queensland species), but the elytral punctures are much smaller and closer together, and those on the prothorax are more evenly distributed. The place of the row of large punctures on the basal segment of the abdomen of other species is taken by a deep impression, somewhat like a wide V, but not as close to the base itself, and this should be a very distinctive feature. The prothorax is nonsquamose, but has rather long, erect, dark setae; on each elytron some white scales form narrow basal vittae on the third interstice and shoulder, and remnants of fasciae about the summit of the apical slope; their setae are longer than on the prothorax, and confined to a single row on each interstice. Scales are absent from the under parts, but the setae are fairly numerous and rather long. The remnant of a carina is so feeble that the prothorax could be fairly regarded as noncarinate.

MECHISTOCERUS TRISINUATUS sp. nov.

Black, antennae and tarsi obscurely reddish. Elytra, head, and legs squamose and setose, elsewhere setose.

Head with crowded, partly concealed punctures in front, naked about base; with a narrow interocular impression. Rostrum slightly longer than prothorax, evenly curved, basal third with distinct ridges, alternated with grooves containing irregular punctures, elsewhere shining and with minute punctures. Antennae inserted about two-fifths from apex of rostrum. Prothorax slightly transverse, sides subparallel to apical third, and then strongly narrowed to apex, with fairly large, crowded punctures, becoming smaller in front. Elytra much

wider than prothorax, base trisinuate, parallel-sided to about middle; with rows of deep, oblong punctures, becoming smaller posteriorly, and contained in striae on the sides. Metasternum with punctures as on prothorax. Two basal segments of abdomen large, each with sparse and small setiferous punctures, third and fourth each with a single row of setae, fifth densely punctate. Femora (especially the hind ones) strongly and acutely dentate; tibiae thin and arched at base. Length, 4 mm.

Malay Peninsula: Gap, on Fraser's Hill (A. M. Lea); unique.

A small species, fairly close to *M. egens* and *M. magnidens* (both from Queensland), but with somewhat different clothing and narrower elytral punctures. The scales on the elytra are greyish-white and black (the latter sparse and indistinct), the pale ones are condensed to form about three very irregular transverse fasciae, and four feeble basal vittae (on the third interstices and the shoulders); on the legs the scales are subsetose in character but pressed flat, the setae being longer and more or less erect. On the upper-surface the setae are suberect and also vary in colour, on the elytra they are longer than on the prothorax (where each arises from a puncture), and are confined to a single row on each interstice. From some directions each of the larger elytral punctures appears to have a basal granule.

MECHISTOCERUS MACULIPENNIS sp. nov.

Black, antennae and tarsi obscurely reddish. Sparsely squamose, but distinctly setose.

Head with dense and rather small punctures, with a narrow, deep, interocular impression. Rostrum slightly longer than prothorax, evenly curved, basal two-fifths with conspicuous ridges, alternated with grooves containing setiferous punctures, elsewhere with minute, naked punctures. Antennae inserted in middle of sides of rostrum, third to seventh joints of funicle transverse. Prothorax moderately transverse, sides parallel on basal half, and then narrowed to apex; with numerous but comparatively small punctures. Elytra much wider than prothorax, base conspicuously trisinuate, sides parallel for a short distance only, with rows of rather large, deep, suboblong granulate punctures, becoming smaller (but not rounded) posteriorly, and on the sides contained in striae. Femora stout and (especially the hind ones) strongly and acutely dentate. Length, 4·5 mm.

Malay Peninsula: Bernam River (A. M. Lea); unique.

In general appearance fairly close to the preceding species, but prothoracic punctures much smaller, elytral clothing not at all fasciate in character, and femoral teeth somewhat larger and the tibiae shorter. The metasternal and

abdominal punctures and setae are much the same. On the elytra whitish scales form numerous feeble spots, including four at the base (on the third interstices and shoulders); black ones are present but very indistinct, on the pronotum pale scales form five very feeble longitudinal lines. The setae are mostly dark on the upper-surface, pale on the under parts, they are somewhat shorter on the prothorax than on the elytra, on the latter they are confined to a single row on each interstice. The prothoracic punctures, although quite sharply defined, are decidedly smaller than is usual in the genus.

MECHISTOCERUS SQUAMIPENNIS sp. nov.

♀ Blackish, antennae and tarsi obscurely reddish. Densely squamose and setose.

Head with crowded, partly concealed punctures, interocular impression small and shallow. Rostrum slightly longer than prothorax, gently curved, basal third with feeble ridges, and coarse, setiferous punctures, elsewhere with numerous small but sharply defined ones. Antennae inserted in middle of sides of rostrum, third to seventh joints of funicle transverse. Prothorax moderately transverse, sides moderately rounded, apex about half the width of base; with crowded but not very large, partly concealed punctures. Elytra rather long, basal half parallel-sided, base distinctly trisinuate; with rows of large, angular punctures, appearing rather small through clothing, and becoming much smaller posteriorly. Metasternum with punctures about as large as on prothorax, with a deep notch in middle posteriorly. Two basal segments of abdomen large, evenly convex, of about the same length along middle; with sharply defined punctures, about as large as on metasternum, but much sparser; third and fourth segments each with a single setiferous row across middle, but dense on sides, apical segment with dense punctures. Front femora feebly, middle moderately, hind ones strongly and acutely dentate. Length, 6 mm.

Malay Peninsula: Gap, on Fraser's Hill (A. M. Lea); unique.

A densely squamose species, to a certain extent approaching *M. calidris*, but narrower, with conspicuous blackish setae, and only the hind femora strongly dentate. The prothorax is shorter than in *M. punctipennis*, with more rounded sides and elytral punctures very different. The general outlines are somewhat as in *M. setiventris* (from Queensland), but the prothorax is smaller in proportion, and the clothing and punctures are very different. Parts of the rostrum and abdomen are obscurely diluted with red. The scales on the elytra are mostly fawn-coloured, mixed with a few small whitish spots and numerous small blackish ones, on the prothorax the scales (but not the setae) are mostly fawn-coloured, on the legs they are also mostly fawn-coloured, but with a dark

spot on each femur and tibia. On the prothorax the setae are numerous, suberect, and short, on the elytra they are longer, confined to a single row on each interstice, and most of them are dark.

MECHISTOCERUS NOCTIVAGUS sp. nov.

♂ Black, antennae and claw-joints reddish. Rather sparsely squamose and setose.

Head with a narrow, deep, interocular impression. Rostrum the length of prothorax, moderately curved, basal two-fifths with ridges, alternated with rows of coarse punctures, elsewhere with minute punctures. Antennae inserted almost in middle of sides of rostrum. Prothorax as long as wide, sides parallel on basal two-thirds, and then rapidly narrowed to apex, which is about half the width of base, and distinctly incurved at its middle; with large, round, deep, crowded punctures, becoming smaller in front; with a short and feeble median carina. Elytra rather long, oblong-cordate, not much wider than prothorax, base straight, except for incurvature at scutellum; with rows of rather large, oblong, deep punctures, becoming smaller posteriorly, and set in striae on the sides; interstices with numerous small punctures. Metasternum with a deep median groove and punctures about as large as on prothorax. Basal segment of abdomen depressed in middle, with a row of basal punctures about as large as those on metasternum, but somewhat smaller posteriorly, and also with very small punctures; second segment flat in middle, and with fairly large punctures, apical with crowded ones, third and fourth each with a setiferous row across middle. Femora stout, and (especially the hind ones) strongly and acutely dentate. Length, 7 mm.

Malay Peninsula: Gap, on Fraser's Hill (A. M. Lea); unique.

Somewhat narrower than *M. calidris*, and with much sparser clothing on elytra, and pronotum practically glabrous, except for a few setae. The scales on the elytra are fairly dense and stramineous or buff, with a subfasciate arrangement, darker scales are almost as numerous but are inconspicuous; setae are thin, feeble, and confined to a single row on each interstice; scales form a pale semicircle between the eyes. The type was attracted to light.

TADIUS (2).

In the diagnosis of this genus the pectoral canal was described as having the apex cavernous. This is incorrect; its apex is deep, and does not end in a vaulted process, but in a notch in the metasternum. The middle coxae are exposed internally to form parts of the pectoral canal as in *Mechistocerus*, *Berosiris*, and *Deretiosus*, there not being a special process on or below which

(2) Pascoe, Ann. Mus. Civ. Gen., 1885, p. 253.

the tip of the rostrum rests in the canal. Of the typical species (*T. erirhinoides*, from Macassar") all Pascoe says of the clothing of the rostrum is "*parce squamosus.*" A cotype male before me of that species has some long bristles projecting outwards from the sides of the rostrum, in advance of the antennae, so that it is bearded somewhat as on the male of *Aonychus barbatus*.

TADIUS AUSTRALIAE sp. nov.

♂ Black, antennae reddish, rostrum and parts of legs obscurely diluted with red. Upper-surface densely clothed with muddy-grey or mouse-coloured scales, interspersed with paler setae, on the elytra confined to a single row on each interstice. Under-surface and legs with dense, whitish, depressed setae.

Head small, with crowded, concealed punctures. Rostrum long, thin, curved, with a feeble median ridge and rather sparsely clothed throughout, about apex with numerous bristles projecting outwards. Antennae inserted about two-fifths from apex of rostrum, two basal joints of funicle elongate. Prothorax about as long as wide, sides almost evenly rounded; with crowded, concealed punctures, and a short and feeble median carina. Elytra much wider than base of prothorax, parallel-sided to beyond the middle, derm normally concealed. Under-surface with crowded punctures, about as large as on prothorax; two basal segments of abdomen large, with a wide and shallow median depression. Femora feebly grooved and edentate. Length, 5 mm.

♀ Differs in having the rostrum thinner, almost glabrous throughout, with rather small but sharply defined punctures, without apical bristles, and with two basal segments of abdomen larger and evenly convex.

Queensland: Bowen (Aug. Simson).

The two specimens of this species were placed with *Desiantha*, of the Erirhinides, to which genus, from above, they have a great resemblance. The male differs from the male of *T. erirhinoides* in having a conspicuous longitudinal depression on the two basal segments of abdomen, with slightly coarser punctures. The elytra are striate-punctate, the punctures of moderate size, and the interstices densely punctate, but before abrasion the elytra appear to be feebly striated only.

TADIUS BARBATUS sp. nov.

♂ Black, antennae and tarsi reddish. Upper-surface densely squamose, the elytra, in addition, with a row of sloping setae on each interstice. Under-surface and legs with dense, subdepressed, whitish setae.

Sculpture as described in male of preceding species, except that the two basal segments of abdomen are gently and evenly convex. Length, 5·0–5·5 mm.

Northern Territory: Darwin (G. F. Hill).

In general appearance resembling several species of *Desiantha;* from the preceding species it differs in being more distinctly marked, and in the abdomen; the lateral bristles of the rostrum are also more numerous. The pectoral canal behind the front coxae cuts into the surface, and is bounded on each side by a feeble wall, certainly denoting a close approach to *Mechistocerus*, in which, however, the walls are much higher and usually on a level with the coxae themselves. The scales on the elytra, the derm of which is entirely concealed, are mostly of a dingy stramineous colour, variegated with irregular sooty-brown spots; on the pronotum they are similarly coloured, but the paler scales form ill-defined longitudinal vittae.

DERETIOSUS.

This genus was originally named from a New Guinea insect (3), but probably occurs on many of the Pacific islands, and is abundantly represented in Fiji. In Australia it appears to be confined to the rain forests of Queensland.

Amongst the allies of *Chaetectetorus*, it is abundantly distinct by the pectoral canal; this cuts slightly into the metasternum, passing by the middle coxae, the inner sides of which act as parts of the walls of the canal, as in *Mechistocerus*. The canal itself is usually densely squamose, an unusual although not unique feature in the subfamily. It is deep between the front coxae, but these at their lowest part are sometimes not quite as widely separated as at their upper part (the insects examined on their backs).

The sexes are usually distinct by the rostrum (clothed on the basal half or more on the male, for one-third or less on the female). The abdomen is less convex on the male than on the female, but the differences are seldom sufficient to be of use.

DERETIOSUS LATEROALBUS sp. nov.

♂ Black, antennae reddish, rostrum and parts of tarsi obscurely diluted with red. Densely clothed with more or less brownish scales, variegated with sooty spots or patches, a distinct whitish spot on the middle of the side of each elytron. Prothorax with six fascicles, elytra with many.

Rostrum moderately curved, apical half shining and with dense and small but distinct punctures, elsewhere densely clothed. Antennae inserted about one-third from apex of rostrum, second joint of funicle distinctly longer than first. Prothorax moderately transverse, sides rounded in middle, apex about half the width of base, punctures normally concealed. Elytra considerably wider than prothorax, base rather feebly trisinuate, with rows of fairly large punctures, appearing much smaller through clothing, and almost vanishing

(3) *D. aridus* Pascoe, Journ. Linn. Soc. Zool., 1871, p. 185, pl. viii, fig. 10.

posteriorly. Basal segments of abdomen large and rather strongly convex, except for a slight median flattening. Femora stout, strongly and acutely dentate, tibiae rather strongly arched at base, the hind ones less strongly than the others. Length, 6·5–8·5 mm.

♀ Differs in having the rostrum slightly thinner, only about one-third of its base concealed by clothing, antennae inserted slightly more distant from its apex, and abdomen more strongly and evenly convex.

Fiji: Viti Levu and Moturiki (A. M. Lea).

The largest of the Fijian species. The extent of sooty or sooty-brown scales varies on almost every specimen; on some of them the dark spots are confined to the legs, and are not much darker than the adjacent parts; on others, in addition, there are a few lateral spots on the elytra; at their maximum they cover most of the sides of the elytra, and much of the under-surface and legs. The white spot on each elytron is very distinct from the side, but almost invisible from above; it is on the third (sometimes partly on the second) interstice from the margin, and level with the basal segment of abdomen. Of the fascicles on the prothorax two are at the apex and four form a curved submedian row, of which the outer ones are larger and more advanced than the median ones; on each elytron every interstice has fascicles, but many are small, especially those on the even ones and near the margin, the two largest (but not very large) are on the third. The fascicles are much shorter than on the Australian species. On abrasion the prothoracic punctures are seen to be close together, and not very large but sharply defined; on the abdomen they are still smaller. The intercoxal process of the mesosternum slopes rapidly downwards in front, but not at the sides, which appear as narrow, elevated ridges considerably below the metasternum. A specimen from Taveuni may belong to this species; it is smaller than usual, but is too much abraded to be identified with certainty.

DERETIOSUS LECTUS sp. nov.

♀ Reddish-brown, antennae paler. Densely squamose and fasciculate.

Rostrum evenly curved, basal third concealed, elsewhere shining and with minute punctures. Antennae inserted in middle of sides of rostrum, second joint of funicle slightly longer and much thinner than first. Prothorax briefly subconical, with crowded, concealed punctures. Elytra considerably wider than prothorax, base trisinuate; striate-punctate, punctures appearing very small through clothing. Femora stout, strongly and acutely dentate; tibiae arched at base. Length, 6 mm.

Fiji: Viti Levu (A. M. Lea); unique.

A beautiful species, not very close to any other from Fiji, and about the size of *D. verrucifer* (from Australia), but on that species each interstice has

fascicles; on the present species (except on the apical slope and on the sides) they are confined to the odd interstices. Very few parts of the derm are visible on the type (owing to the density of scales), and such as are, are all reddish; it is probable, however, that most parts are black on some specimens. The scales are mostly of a delicate fawn or buff, becoming paler on the prothorax and under parts; the head and legs are feebly variegated and with scattered setae. There are six fascicles on the prothorax; two, loosely composed of dark setae, at apex, and four across middle, of which the two median ones are blackish-brown, and the outer ones elongate. On the elytra there are numerous small fascicles on the odd interstices, but with a few on the even ones posteriorly, and on the sides; each of the small fascicles is composed of a short, upright, central seta in the middle of a slight swelling; there is a large elongate fascicle (supported on a tubercle) on the third interstice commencing near the base, and a smaller one about the middle. The outlines of prothorax and elytra, as viewed from the sides, are sinuous, the prothorax with a gentle curve between the base and the outer fascicle, and a deeper one between the latter and the apex; on the elytra there is a rather deep, even curve between the two large fascicles on the third interstice. The pectoral canal is slightly dilated at its apex (in the metasternum).

DERETIOSUS MUTICUS sp. nov.

♂ Black, some parts obscurely diluted with red, antennae pale red, club darker. Densely squamose, setose, and fasciculate.

Rostrum moderately curved, the length of prothorax, apical third with small but sharply defined and rather dense punctures, elsewhere derm concealed. Antennae inserted two-fifths from apex of rostrum. Prothorax moderately transverse, apex about half the width of base; with crowded, concealed punctures. Elytra considerably wider than prothorax, base distinctly trisinuate; striate-punctate, punctures normally concealed. Femora edentate, tibiae stouter and less arched at base than usual. Length, 4–5 mm.

♀ Differs in having the rostrum longer, thinner, clothed only at basal fourth, with smaller and less distinct punctures, and antennae inserted nearer its base than apex.

Fiji: Viti Levu (A. M. Lea).

The femora are edentate, a character unique in the genus, but as the other characters are in agreement with *Deretiosus* it does not appear desirable to refer the species to a new genus. The scales are mostly of a rather dingy brown, becoming somewhat paler on the under parts; on the elytra there is usually a white or whitish V, commencing near the base, with its two parts joined on the

suture just before the middle, and very distinct on some specimens; there is also a pale fascia traversing the summit of the apical slope, but it is sometimes scarcely traceable. On the prothorax there are six fascicles, in the usual positions, and some stout setae scattered singly; on each elytron there is only one distinct fascicle, an elongate one on the third interstice near base, but on the odd interstices there are numerous stout, spatulate, erect setae, each surrounded by a slight swelling, but they could hardly be regarded as true fascicles. There are some fairly stout setae on the legs.

DERETIOSUS VARIEGATUS sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with variegated scales, and with numerous fascicles.

Rostrum moderately curved; with small, crowded punctures on apical half, concealed elsewhere. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides rather strongly rounded, with crowded concealed punctures. Elytra much wider than base of prothorax; base not trisinuate, shoulders oblique; with rows of almost concealed punctures. Femora stout, strongly and acutely dentate, tibiae arched at base. Length, 5 mm.

Fiji (Blackburn's collection).

A beautifully marked species, with two large fascicles on the third interstice on each elytron, each of the posterior of which is connected with its fellow on the other elytron by a white V, somewhat as on *D. blandus* and *D. aridus*, but these are considerably larger, rougher species, with very different fascicles. The clothing is so dense as to conceal the derm; on the upper-surface it is rusty-red, variegated with white and shades of chocolate-brown; on the under-surface it is mostly mouse-coloured, irregularly mixed with whitish-grey; the legs are conspicuously variegated, and setose. There are six rusty-red fascicles on the pronotum, in the usual positions; on each elytron there are three rusty-red ones on the third interstice: a fairly large one at the basal third, a slightly larger median one, and a small one beyond it; on the other odd interstices there are some small fascicles of various colours, the largest of which is on the preapical callosity. One specimen has the upper-surface almost completely abraded of scales, its prothorax is closely covered with punctures of moderate size, and subtuberculate beneath the fascicles. On the elytra the punctures in the rows are somewhat larger than on the prothorax, but become of much the same size posteriorly, and on the sides all the fascicles are seen to be supported by tubercles, two on the third interstice on each elytron being very conspicuous.

DERETIOSUS EXITHIOIDES sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with variegated scales, and with numerous fascicles.

Rostrum moderately stout, scarcely the length of prothorax, opaque and with dense punctures on apical half, basal half densely clothed. Antennae inserted about one-third from apex of rostrum, third to seventh joints of funicle rather strongly transverse. Prothorax moderately transverse, sides feebly dilated from base to about the apical third, and then strongly narrowed to apex, space bounded by six fascicles depressed; with crowded, concealed punctures. Elytra not much wider than widest part of prothorax, base trisinuate; with rows of punctures appearing small through clothing. Femora stout, moderately dentate, tibiae arched at base. Length, 4–5 mm.

Fiji: Taveuni (A. M. Lea).

With a white V, as on the preceding species, but narrower and apical portion of prothorax depressed, with a general suggestion of the Tasmanian *Exithius cariosus*. The scales on the upper-surface are mostly of various shades of brown, becoming pale on the apex of prothorax and sides of elytra; there is a conspicuous white V, connecting the two large median fascicles on the third interstices, the scales enclosed by it being velvety-black; on the under-surface the scales are mostly whitish-grey, variegated with brown on the sides; the head and legs are slightly variegated, and the latter are setose. There are six fascicles on the prothorax, two in front, two in middle, and one on each side, half-way between and longer than the others; on each elytron there are numerous small fascicles, and two larger than the others on the third interstice: one at the basal fourth, the other about the middle.

DERETIOSUS V-NIGER sp. nov.

♂ Blackish, antennae and tarsi reddish, rostrum and parts of legs obscurely diluted with red. Densely squamose and fasciculate.

Rostrum rather thin, slightly longer than prothorax, apical two-fifths with small punctures, elsewhere densely clothed. Antennae inserted slightly nearer apex than base of rostrum. Prothorax distinctly transverse, sides rounded, apex strongly narrowed and about half the width of base; with crowded concealed punctures. Elytra considerably wider than prothorax, base trisinuate; striate-punctate, punctures normally concealed. Femora strongly and acutely dentate, tibiae moderately arched at base. Length, 4·0–4·5 mm.

♀ Differs in having the rostrum longer, thinner, clothed only near base, and antennae inserted slightly nearer the base.

Fiji: Viti Levu (A. M. Lea); two specimens.

Fairly close to the preceding species, but with fascicles on all the interstices, instead of missing most of the even ones; the fascicles of the upper-surface and the elytral markings are sufficiently distinctive from *D. verrucifer*. The scales on the upper-surface of the type are mostly of a dingy brown, and but slightly

variegated; there are, however, two parentheses-like, blackish marks on the third interstices at the base, and a large blackish V, the parts commencing on each shoulder, and meeting on the suture about the middle; on the under-surface and legs the scales are somewhat paler than on the upper parts, and are also obscurely variegated. On the female the elytral clothing is mostly darker, only the basal halves of the parentheses-like markings are present, and the V is much less defined, although traceable. There are six rather feeble fascicles on the pronotum, the front ones being darker than the others; on the elytra there are small fascicles on all the interstices, but smaller and less numerous on the even than on the odd ones.

DERETIOSUS SCUTELLARIS sp. nov.

♂ Reddish-brown, antennae paler. Densely clothed with variegated scales, and feebly fasciculate.

Rostrum about the length of prothorax, parallel-sided, its entire upper-surface densely clothed. Antennae inserted on sides of rostrum about two-fifths from apex. Prothorax moderately transverse, sides feebly decreasing in width to apical third, and then more strongly to apex; with crowded, concealed punctures. Elytra rather narrow, not much wider than prothorax, base distinctly trisinuate; striate-punctate, punctures almost concealed. Femora moderately stout, very feebly dentate, tibiae feebly arched at base. Length, 4 mm.

Fiji: Viti Levu (A. M. Lea).

A comparatively small species, with clothing on the upper-surface conspicuously variegated. The compaction of erect setae on the prothorax is so slight that perhaps it should not be regarded as fasciculate at all; in this it differs from *D. lectus* and *D. V-niger*, on which the fascicles are distinct; those species are also larger and wider in proportion. The femoral dentition is very feeble, and, in fact, the teeth are invisible from most directions. On both specimens under examination the derm is probably nowhere black, but it is visible only where scales have been abraded. On the type the elytral scales are mostly of a rather dingy brown, becoming sooty on parts of the sides and for two small spots on the suture (one touching the scutellum, the other near the apex); white scales form a curved mark on each shoulder, and a broad fascia, dilated to each side, crowning the apical slope; with irregularly distributed ones between it and apex. The scutellum is snowy. On the prothorax whitish scales are in the majority, on the head pale brown ones. The rostrum has three brownish lines. On the under parts the clothing is mostly white, but with distinct spots on the legs. The prothorax could hardly be regarded as fasciculate, but there are loose clusters of short, erect setae, marking the positions of two apical fascicles; the submedian row is still less defined. On the elytra there

are numerous feeble fascicles (sparse on the even interstices), mostly consisting of a feeble swelling, about a short, stout, central seta, but there are two fairly long ones on each third interstice (one near the base, the other just before the middle). On the second example the brown scales on the elytra have a more reddish shade, and cover much less of the surface, the white scales clothing most of the apical half, but the two dark sutural spots are present; its rostrum has only two brownish lines, but there is a dark spot between the bases of antennae; the under parts are almost wholly whitish. The fascicles on its elytra are almost confined to the odd interstices.

DERETIOSUS APICALIS sp. nov.

♂. Dark brown, antennae reddish. Densely squamose, and fasciculate.

Rostrum comparatively stout, scarcely the length of prothorax, basal half densely clothed, apical half with numerous small, naked punctures. Antennae inserted one-third from apex of rostrum, third to seventh joints of funicle rather strongly transverse. Prothorax slightly transverse, sides moderately rounded; with crowded, concealed punctures. Elytra not much wider than prothorax; striate-punctate, punctures normally concealed. Femora acutely but not very strongly dentate; tibiae moderately arched at base. Length, 3·75 mm.

Fiji: Viti Levu (A. M. Lea); unique.

On the apical portion of the elytra the scales are almost entirely white, conspicuously bounded in front by a wide M, the middle part of which is a V, connecting two fascicles on the third interstices; on the rest of the elytra the scales are of various shades of brown, almost sooty immediately in front of the M. On the prothorax, head, and legs the scales are mostly pale brown; on the metasternum and abdomen they are mostly whitish. There are six feeble fascicles on the prothorax in the usual positions; on the elytra there are numerous feeble ones, but almost confined to the odd interstices. On *D. variegatus* and *D. exithioides* (which are also larger species) the white V on the elytra is narrow; on the present species it is only part of the basal margin of a large, white, apical patch.

DERETIOSUS PURPUREOTINCTUS sp. nov.

Blackish, some parts obscurely reddish; antennae (club excepted) paler. Densely squamose, setose, and fasciculate.

Rostrum moderately thin, about the length of prothorax, basal two-fifths densely clothed, elsewhere with numerous small but sharply defined punctures. Antennae inserted almost in middle of sides of rostrum. Prothorax slightly transverse, sides gently rounded; with crowded, concealed punctures. Elytra much wider than prothorax, base slightly trisinuate; striate-punctate, punctures

almost concealed. Femora feebly dentate, tibiae somewhat arched at base. Length, 3 mm.

Fiji: Viti Levu (A. M. Lea); unique.

Most of the scales on the elytra are somewhat plum-coloured, but variegated with shades of brown and velvety black, the tips are almost stramineous, two large blackish patches form an irregular V, the arms commencing on the fourth interstices near the base, and joined on the suture beyond the middle; on the prothorax and legs the scales are mostly dark brown, with a faint purplish tinge; on the metasternum and abdomen the scales are mostly whitish, with a faint tinge of purplish. On the apical half of the prothorax there are numerous stout, erect setae, loosely compacted to form six feeble fascicles, but there are a few setae elsewhere; on the elytra there are similar stout setae, almost confined to the odd interstices, but forming a distinct fascicle on the third interstice near base, and a feeble postmedian one; there are also some stout setae on the legs. The femoral teeth are not very strong, and are nearer the base than usual.

DERETIOSUS ANGUSTUS sp. nov.

Blackish, some parts obscurely diluted with red, antennae reddish. Densely squamose, and with stout, erect setae.

Rostrum about the length of prothorax, apical half with numerous small but rather distinct punctures, elsewhere densely clothed. Antennae inserted slightly nearer apex than base of rostrum. Prothorax slightly transverse, apex about half the width of base; with crowded, concealed punctures. Elytra not much wider than prothorax, base strongly trisinuate; striate-punctate, punctures normally concealed. Femora acutely but not very strongly dentate; tibiae slightly arched at base. Length, 3·0–3·3 mm.

Fiji: Viti Levu (A. M. Lea).

A small and rather narrow species, rather close to *D. scutellaris*, but smaller, and with somewhat stronger femoral dentition, although finer than on most species of the genus. It has somewhat the appearance of species of *Ephrycus*. On the upper-surface of the type the scales are mostly of various dingy shades of brown intermingled, with a few whitish spots scattered about; on the under-surface of body and of femora they are mostly whitish. On the apical half of the prothorax there are stout, erect setae, but their compaction into fascicles is very feeble; on the elytra there are similar erect setae, confined to the odd interstices, and forming a feeble fascicle on the third interstice near base, and a still more feeble one on each near middle. On a second specimen the clothing is much the same, except that the prothorax is subvittate. On a third one the clothing is mostly whitish, mixed with dingy brownish-grey.

DERETIOSUS INVENUSTUS sp. nov.

Blackish, antennae, tarsi and part of abdomen reddish. Densely squamose, and with stout, erect setae.

Rostrum about the length of prothorax, densely clothed almost to tip, where there are small, crowded punctures. Antennae inserted about two-fifths from apex of rostrum. Prothorax distinctly transverse, sides gently decreasing in width from base to beyond the middle, and then rapidly to apex; with crowded, concealed punctures. Elytra moderately trisinuate at base; striate-punctate, punctures almost concealed. Femora acutely dentate, tibiae moderately arched at base. Length, 3 mm.

Fiji: Viti Levu (A. M. Lea); unique.

The femoral teeth are acute and rather small but well defined, certainly stronger than on *D. scutellaris* and *D. purpureotinctus;* the pale tips of the elytra are as on the latter species, but the dark V is absent; the rostrum is clothed not quite as close to the apex as on the former species, and the scutellum is not white. The scales are mostly of dingy shades of brownish-grey, becoming paler at the tips of elytra, and almost uniform on the under-surface. The setae are mostly darker; on the prothorax they are not at all compacted into fascicles in front, but rather feebly so across the middle; on each elytron they are confined to the odd interstices, and form three feeble ones on the third.

DERETIOSUS MINUTUS sp. nov.

♂ Blackish, antennae and tarsi reddish. Densely squamose and setose.

Rostrum about the length of prothorax, densely clothed almost to tip. Antennae inserted about one-third from apex of rostrum. Prothorax almost as long as wide, sides gently rounded, apex more than half the width of base; with crowded, concealed punctures. Elytra not much but distinctly wider than prothorax, base gently trisinuate; striate-punctate; punctures large, round, and deep, but normally almost or quite concealed. Femora acutely but not very strongly dentate; tibiae moderately arched at base. Length, 2·2–2·5 mm.

Fiji: Viti Levu (A. M. Lea).

The smallest known species of the genus. On the type the scales are mostly of a rusty-brown, slightly variegated with paler and darker shades. From above the pronotum is seen to have three rather pale, longitudinal vittae, continuous from base to apex without interruptions, each side also (invisible from directly above) has an additional vitta, somewhat shorter but also without interruptions. On the under-surface and legs the scales are mostly whitish, varied with pale brown. The stout setae are mostly darker than the adjacent scales; on the pronotum they are in places somewhat compacted, but not enough to form

distinct fascicles; on the elytra they are confined to the odd interstices, but on the third on each elytron are compacted to form two feeble blackish fascicles. On a second specimen the clothing is as on the type, except that the brown scales on the elytra are of a dingier shade and mottled with whitish-grey.

Three specimens (also from Viti Levu) probably belong to this species, but they have the five vittae of the pronotum interrupted by a pale fascia, which traverses it slightly nearer the apex than base. Another specimen from Viti Levu has fewer erect setae on the pronotum, and the scales of an almost uniform shade of pale dingy-brown.

DERETIOSUS SUBARIDUS sp. nov.

♂ Black, antennae reddish, club darker. Densely squamose, and with numerous setae and fascicles.

Rostrum the length of prothorax, rather feebly curved, densely clothed to near apex, where the punctures are small and crowded. Antennae inserted about one-third from apex of rostrum. Prothorax distinctly transverse, sides dilated in middle, apex about half the width of base; with crowded, concealed punctures. Elytra considerably wider than prothorax, base trisinuate; with rows of large, round, deep punctures, appearing small through clothing. Femora stout, strongly and acutely dentate, tibiae bisinuate on the lower surface. Length, 6–7 mm.

♀ Differs in having the rostrum longer and thinner, clothed only on the basal fourth, and the antennae inserted nearer the middle of rostrum.

New Guinea: Manumbo (Madang district).

In size and general appearance close to *D. aridus,* but the V on the elytra inconspicuous or absent, without large postmedian fascicles, and those on the prothorax also different. The clothing generally is of a pale, rusty-brown colour, not much variegated, and not much paler on the under-surface than on the upper parts. On the head there are two feeble interocular fascicles, and four irregular rows of erect setae on the rostrum. On the prothorax there are six distinct fascicles, in the usual positions, and some stout setae scattered singly; on the elytra there are numerous small fascicles on the odd interstices, and a fairly large one on the third near base; in addition there are some stout setae on the even interstices. On the legs the setae are numerous; on the abdomen they are rather thin and sparse, but the mesosternal portion of the pectoral canal is margined with long setae, forming small fascicles. The elytra have a slightly striated appearance, but this is partly confused by the stiff setae and small fascicles on the interstices.

DERETIOSUS ATRATUS sp. nov.

Black, tip of rostrum and tarsi obscurely diluted with red, antennae paler. Densely squamose and setose.

Rostrum about the length of prothorax, with coarse, partially concealed punctures on basal half, small and naked in front. Antennae inserted slightly nearer apex than base of rostrum. Prothorax about as long as wide, evenly convex, sides gently and evenly rounded, apex about half the width of base; with crowded, concealed punctures. Elytra much wider than prothorax, base conspicuously trisinuate; striate-punctate; punctures large but almost concealed by clothing. Femora strongly and acutely dentate, tibiae arched at inner base, oblique at outer base. Length, 6 mm.

Java: Buitenzorg, one specimen at light (A. M. Lea).

A dingy species, with prothorax more evenly convex than usual, and somewhat aberrant tibiae. The scales on the upper-surface are mostly of a sooty-brown, and but feebly variegated. On the under-surface they are mostly pale. The short, erect setae vary from greyish, through brown, to black; they are sparse on the basal half of prothorax, but numerous on the front half, where they are compacted to form six loose fascicles; on the elytra the setae are more numerous on the odd than on the even interstices, the blackish ones are compacted into a cluster of small fascicles about the scutellum, and three placed obliquely on each elytron before the middle, on the third, fourth, and fifth interstices, but the one on the fourth is very feeble.

DERETIOSUS FASCICULATUS sp. nov.

Blackish, rostrum, antennae, and tarsi reddish. Densely clothed with rusty-brown scales, and with numerous similarly coloured setae and fascicles; on most of the under-surface the clothing is sparse and whitish.

Rostrum rather thin, moderately curved, slightly longer than prothorax; near base with coarse, crowded punctures, elsewhere shining and with minute punctures. Antennae inserted distinctly nearer base than apex of rostrum, second joint of funicle thin and longer than first. Prothorax moderately transverse, sides rounded in middle, apex about half the width of base; with crowded, partly concealed punctures. Elytra comparatively short, much wider than prothorax, base trisinuate; with series of comparatively small punctures, only slightly concealed by clothing, and some of the rows deflected by the larger fascicles. Femora stout, strongly and acutely dentate, tibiae strongly arched at base. Length, 6·5 mm.

Malay Peninsula: Gap on Fraser's Hill (A. M. Lea); unique.

Very distinct by the numerous long fascicles, of which there are six on the

prothorax (two at apex and four across middle); on each elytron there are three large ones on the third interstice, three on the fifth, and many small ones on the lateral interstices and on the suture, but the second and fourth are without any; the numerous fascicles on the suture are small, but each has a stout central seta. The front coxae are less widely separated than usual, and the middle of the metasternum slopes downwards in line with the intercoxal process of the metasternum, instead of being notched. The femoral dentition is unusually strong. The type is probably a female.

DERETIOSUS SETOSUS sp. nov.

Dark brown, rostrum, antennae, and tarsi reddish. Densely clothed with greyish scales, feebly variegated with pale brown, and interspersed with stout setae; on under parts mostly greyish-white.

Rostrum evenly curved, about the length of prothorax, basal fourth densely squamose, elsewhere shining and with minute punctures. Antennae inserted distinctly nearer base than apex of rostrum. Prothorax rather strongly transverse, apex less than half the width of base; with crowded, concealed punctures. Elytra rather elongate, not much wider than prothorax, base feebly trisinuate; striate-punctate, punctures almost concealed. Femora moderately stout, acutely and rather strongly dentate; tibiae slightly arched at base. Length, 3·5 mm.

Malay Peninsula: Gap on Fraser's Hill (A. M. Lea).

A rather small species, with pectoral canal and other generic features strictly in agreement with most of the species from Australasia. The setae on the pronotum are loosely compacted in places, but do not form distinct fascicles; on the elytra they are confined to the odd interstices (except for a few near the sides), and also do not form distinct fascicles, although a few are loosely compacted on the third interstice near base. The two specimens taken appear to be females. The second specimen is paler than the type, its derm (where the scales have been abraded) being not much darker than the rostrum, which is bright castaneous; the clothing of its upper-surface is stramineous, mottled with pale and dark brown.

DERETIOSUS INTERCOXALIS sp. nov.

♂ Blackish, some parts obscurely diluted with red, antennae and tarsi reddish. Densely clothed with muddy-brown or greyish-brown scales, interspersed with numerous stout setae, and with a few fascicles.

Rostrum comparatively stout, almost straight, densely clothed throughout. Antennae inserted one-third from apex of rostrum, third to seventh joints of funicle transverse. Prothorax subconical, slightly longer than wide, with

crowded, concealed punctures. Elytra not much wider than prothorax, base distinctly trisinuate; striate-punctate, punctures almost concealed. Femora acutely dentate, tibiae slightly arched at base. Length, 3 mm.

Borneo: Labuan Island (C. T. McNamara); Malay Peninsula: Gap on Fraser's Hill (A. M. Lea).

When the rostrum is in the canal its tip appears to be resting in a fringed mesosternal receptacle, but on removing it there is seen to be a fringe of long scales, which partly conceal the middle legs, which, except for these, would be exposed internally, as on most species of the genus. The preceding species is entirely without this fringe. On the type there is an obscure, dark median fascia on the middle of the elytra, immediately followed by a pale one. At the apex of its prothorax there are numerous stiff setae, which are compacted to form loose fascicles; across the middle there are also numerous setae, but they are scarcely compacted into fascicles. On each elytron the setae are almost confined to the odd interstices, and form two fairly distinct fascicles on the third interstice, one near the base, the other median. On the specimen from the Gap the fascicles are as distinct as on the type, but the elytral fasciae are scarcely traceable.

DERETIOSUS TIBIALIS sp. nov.

Black, antennae and tarsi obscurely reddish. Densely squamose, setose, and fasciculate.

Rostrum moderately stout, slightly curved, about the length of prothorax, with crowded and rather coarse punctures, concealed on basal half. Antennae inserted about two-fifths from apex of rostrum. Prothorax almost as long as wide, basal two-thirds sub-parallel-sided; with crowded, concealed punctures. Elytra rather long, distinctly but not much wider than prothorax, base distinctly trisinuate; striate-punctate, punctures almost concealed by clothing, preapical callosities fairly distinct. Femora strongly dentate, outer base of tibiae obliquely truncated. Length, 9–10 mm.

Moa (or Banks) Island (C. T. McNamara); "Australie" (A. Bovie); New Guinea (coll. Pape in Berlin Entomological Museum); Java (McNamara).

The large size and angulate tibiae readily distinguish from all previously described species of the genus. There are two small fascicles on the front part of the mesosternal portion of the pectoral canal, but they are concealed with the rostrum in position. The four specimens examined are structurally in close agreement, but the clothing, although of the same nature, differs in colour; it is very dense, even on the abdomen, where the scales are of two kinds, comparatively small depressed ones, and larger slightly less depressed ones, taking the place of setae, although too wide and depressed to be regarded as true setae.

On all of them the scutellum is glabrous and shining. On the Moa Island specimen (the type) the clothing varies from pale stramineous, through various shades of brown, to sooty-black; there is a fairly distinct blackish fascia crowning the apical slope of the elytra, the scales behind it, and two spots before it being paler than elsewhere. On the pronotum the scales are mostly of a dingy-brown, with a pale median line and numerous blackish setae, the latter compacted to form four feeble fascicles, slightly in advance of the middle, and two still more feeble ones at apex. Each elytral interstice has a row of short setae, but on the odd ones there are black fascicles as well, most numerous on the suture, largest on the third interstice; the legs are somewhat mottled. On the specimen from "Australie" the clothing is mostly pale stramineous-brown, the median line on the pronotum whitish, and the elytra almost without markings, except for a dark angular patch, beginning narrowly at the scutellum, and suddenly dilated at the middle (where it extends across three interstices on each side of the suture), and then rapidly terminated. On the pronotum the fascicles are still less distinct than on the type, and there are no dark setae scattered about; on the elytra the setae and fascicles are less distinct than on the type. The specimen from New Guinea has most of the clothing as on the second specimen, but the elytra have several obscurely dark patches, and a pale V, slightly beyond the middle; the elytral fascicles and setae are much the same, but the submedian fascicles of the pronotum are more distinct. The one from Java has the clothing mostly of a sooty-brown.

ASYTESTA (4).

This genus appears to be well represented in New Guinea and adjacent islands, but in all the references to its species that I have seen (including the generic diagnosis) no mention is made of a ring-like carina on the head; the ring is part of a perfect circle, and is interrupted for about twenty per cent. of its outline only near the base, where it touches the pronotum, and is there broken by a triangular nude space which extends narrowly forward. On old and dirty specimens it is not always distinct, but it appears to be always traceable. It is distinct on *A. gazella* Oliv., *humeralis* Pasc., and *vittata* Pasc., all of which have the front femora bidentate.

A similar but more widely interrupted circle is to be seen on the heads of *Eudyasmus* and on *Cyamobolus trivittatus* Pasc., but the latter certainly belongs to a different genus from *C. funereus* Pasc., and *dehaani* Mannerh.

ASYTESTA CIRCULIFERA sp. nov.

♂ Black, antennae (club darker), and claw-joints reddish. Densely clothed with sooty-brown and stramineous scales.

(4) Pascoe, Journ. of Ent., ii, p. 426.

Head with a narrow, carinated circle extending to level with the hind edge of the eyes, and interrupted at the base by a narrow glabrous triangle. Rostrum about the length of prothorax, slightly less than basal half densely squamose and with setiferous granules; elsewhere naked, and with coarse, crowded punctures. Antennae rather thin, inserted about two-fifths from apex of rostrum. Prothorax rather strongly convex, about one-fifth wider than long, sides rather strongly rounded, apex depressed and scarcely half the width of base; with numerous rather large setiferous punctures, each usually backed by a small, shining granule. Scutellum small. Elytra about once and one-fourth as long as wide, base trisinuate and no wider than prothorax, sides parallel to beyond the middle; with somewhat irregular rows of large punctures, appearing much smaller through clothing, third interstice conspicuously raised and densely granulate from near base to near apex, fifth less conspicuously elevated, but all the interstices with granules. Basal segment of abdomen flattened in middle, almost as long as the rest combined. Legs long and thin, front femora strongly, middle moderately, hind ones slightly unidentate; front tibiae compressed, rather suddenly dilated at apical third, thence obscurely serrated to apex on under-surface. Length, 5·0–6·5 mm.

♀ Differs in having the rostrum longer, thinner, less of the base clothed, with smaller punctures, antennae inserted slightly nearer the middle of rostrum, basal segment of abdomen evenly convex, and legs somewhat shorter.

New Guinea: Manumbo (Madang district).

Differs from specimens, from Ternate, sent to me by Dr. Gestro as *A. humeralis*, in its conspicuously vittate pronotum and unidentate front femora. The stramineous scales form a narrow triangle on the head (sometimes concealed by the overlapping prothorax) margin the eyes, form a narrow median line on the pronotum, and several irregular spots on the apical third and about the base; on each elytron they form a short vitta at the base of the fifth interstice, connected with a small basal patch extending to the shoulder (on three specimens the vittae are almost white); on other parts of the elytra there are numerous small spots, on some specimens irregularly conjoined to form feeble fasciae. There is also a conspicuous spot (with a darker centre) in front of each front coxa. The femora are usually ringed. The glabrous triangle at the base of the head (on this and the two following species) is traversed by numerous fine ridges, and is probably used for stridulation.

ASYTESTA GRANULIFERA sp. nov.

♂ Black, antennae obscurely reddish, club darker. Densely clothed with pale greyish scales, mixed with sooty ones.

Head with an interrupted circular carina as on the preceding species. Rostrum slightly shorter than prothorax; with coarse, crowded punctures, concealed about base and on sides of basal half. Antennae inserted about two-fifths from apex of rostrum, two basal joints of funicle long. Prothorax, elytra, and abdomen much as in the preceding species, except that the prothorax is slightly longer, with more conspicuous setiferous granules, and that the elevated part of the third interstice, on each elytron, is less dilated near the base. Pectoral canal densely squamose, its posterior end open. Legs long, femora unidentate; tibiae compressed, the front ones with an obtuse dentiform projection at basal third, between it and apex finely denticulate and fringed. Length, 6·5 mm.

♀ Differs in having the rostrum longer, thinner, with much smaller and less crowded punctures and less clothed, basal segment of abdomen evenly convex, and legs shorter.

Queensland or New Guinea (H. J. Carter from F. P. Dodd).

The general outlines are somewhat as in the preceding species, but the dilated part of the front tibiae begins more suddenly, with a dentiform process, the granules are more numerous and distinct on the upper-surface, and the fifth interstice on each elytron is not vittate at the base; the pectoral canal is densely clothed, and the mesosternal receptacle is truly open, instead of slightly cavernous. The majority of the scales on the upper-surface are pale. On the pronotum there is a pale, narrow, median line, about half of its scales are sooty in ill-defined spots, of which there is a series across the apical third; on the elytra the darker patches are less conspicuous than on the prothorax, and appear mostly like slight stains, the outer margins are almost white; on the under-surface there are some dark spots, of which there is a very distinct one, surrounded by almost white scales, in front of each front coxa. On each of two females a fairly large space about the scutellum is glabrous.

Four specimens were labelled as from Kuranda, in Queensland; it is probable, however, that they are really from the Astralobe Range in New Guinea, where Mr. Dodd collected for some time.

ASYTESTA SETIPES sp. nov.

♂ Black, antennae obscurely reddish. Densely clothed with dark brown scales, variegated with paler and darker ones.

Head with an interrupted circular carina. Rostrum almost as long as prothorax, almost straight; with coarse, crowded punctures, concealed on basal half by scales mixed with setiferous granules. Antennae inserted about two-fifths from apex of rostrum. Prothorax and elytra with outlines and punctures as on preceding species. Basal segment of abdomen flat in middle. Legs long,

femora unidentate; tibiae compressed, the front ones suddenly dilated at basal third, between them and apex obtusely denticulate. Length, 6·5 mm.

Territory of New Guinea: Wau Creek, at its junction with Bulolo River (W. W. Weidenbach); unique.

Differs from the two preceding species in the absence of prothoracic vittae; in its pectoral canal and front tibiae it is nearer *A. circulifera* than *A. granulifera*. On the pronotum there are four, obscurely defined, dark spots across the apical third, one on each side of the middle at base; there are also numerous minute, pale spots, mostly adjacent to the dark ones; on the elytra there are some small and irregular dark spots. The setae arising from the granules are mostly pale; on the base of rostrum, apical half of elytra, and legs they are white; on the femora they are longer and more distinct than elsewhere, although their supporting granules are smaller.

NECHYRUS (5).

The species of this genus are more numerous in New Guinea and adjacent islands than in Australia. They are all nocturnal, and occur in dead timber, so it is probable that many more remain to be discovered.

Pascoe described the femora as unarmed, but on most of the species known to me they are really dentate, although the teeth are so small that they are usually concealed by the clothing.

NECHYRUS CRIBATUS sp. nov.

Black, antennae and parts of tarsi obscurely reddish. Densely clothed with scales and setae, mostly rusty-brown on upper parts, mostly black on under parts; elytra fasciculate.

Head with crowded punctures each containing a scale, and with a small interocular impression. Rostrum long, thin, slightly curved, sides incurved between base and antennae, parallel-sided in front of them; basal two-fifths with fine ridges and rows of punctures, partly concealed by clothing, elsewhere glabrous and with dense, sharply defined punctures. Antennae inserted two-fifths from base of rostrum, two basal joints of funicle as long as the five following ones combined. Prothorax almost as long as the greatest width, sides evenly rounded to subapical constriction, apex about half the width of base; with evenly distributed punctures, each containing and concealed by a scale, but on the sides (invisible from above) the punctures are larger and their contained scales smaller. Scutellum minute. Elytra about one-fourth wider than prothorax, sides subparallel to slightly beyond the middle; with rows of large, deep punctures, conspicuous on sides, partly concealed elsewhere; third interstice on

(5) Pascoe, Journ. Linn. Soc., 1871, p. 203.

each elytron with three fasciculate tubercles: an elongate one at base, one at middle (with black scales), and one crowning the apical slope; fifth interstice with three at and about the summit of apical slope; shoulders also with a fasciculate tubercle. Mesosternal receptacle elongate, U-shaped, almost open posteriorly. Metasternum and two basal segments of abdomen with very large, round punctures. Legs long; femora slightly dentate. Length, 8 mm.

Lord Howe Island (A. M. Lea); unique.

The elytral fasciculate tubercles are less numerous than on *N. incomptus*, but those present are in the same relative positions; there are four distinct fasciculate projections at the base of the elytra. There are a few minute granules on the elytra, but they are mostly concealed by the scales. The setae on the upper-surface are mixed with the scales and are inconspicuous; on the under parts (as viewed from the sides) they are thinner, more numerous, and distinct; they form a single row across each of the third and fourth abdominal segments. There are no fascicles on the pronotum. The punctures of the under-surface are unusually large.

NECHYRUS SCUTELLATUS sp. nov.

♂ Black. Antennae obscurely diluted with red. Densely clothed with scales and setae, variegated on upper-surface, and forming fascicles, almost uniformly greyish on under parts.

Head with dense punctures, each containing and concealed by a scale, with a small interocular impression. Rostrum moderately long and curved, basal half with a median carina and irregular rows of squamiferous punctures, elsewhere shining and with minute punctures. Antennae inserted almost in middle of sides of rostrum, second joint of funicle longer than first, their combined length equal to that of the four following ones. Prothorax slightly wider than long, sides moderately rounded, feebly narrowed to base and strongly to apex; with an acute and almost continuous median carina; and with large, round, deep punctures, each almost as large as the scutellum and containing a seta. Scutellum comparatively large and distinctly elevated. Elytra slightly wider than prothorax, subparallel-sided to beyond the middle, base trisinuate, slightly elevated throughout, with shoulders clasping prothorax; with rows of large punctures, usually larger than those on prothorax, each interstice with a row of small, shining granules, but those about suture inconspicuous. Mesosternal receptacle elongate, U-shaped, almost open posteriorly. Under-surface with crowded punctures; basal segment of abdomen depressed in middle. Legs long, femora minutely dentate. Length, 8–10 mm.

♀ Differs in having the rostrum longer, thinner, more curved, the median carina shorter and less conspicuous, less of the base clothed, antennae inserted

slightly nearer base than apex of rostrum, basal segment of abdomen convex in middle, and legs somewhat shorter.

Aru (H. Elgner).

The largest specimen is shorter than the length noted for *N. puncticollis*, also from Aru. The fascicles are mostly fairly large, but composed of short scales or setae, mostly black; there are two at apex of prothorax, and four across middle (the outer ones feeble), also two at base; the latter are feeble, and sometimes obscurely connected with the two inner ones of the submedian row; on each elytron there is a rather large one on the third interstice at base, and another crowning the apical slope; the latter is connected by black scales with the suture and the fifth interstice, so that the summit of the slope appears to be crowned with a black, scaly fascia; there are other small and inconspicuous fascicles scattered about. The ordinary scales of the upper-surface vary from greyish-white, through various shades of brown, to sooty or black. The clothing on the third and fourth segments of abdomen is as dense as on the adjacent ones. On several females parts of the rostrum are obscurely reddish.

NECHYRUS ATER sp. nov.

♂ Black, antennae obscurely reddish. Densely clothed with sooty scales, becoming rusty-brown on scutellum and under-parts.

Head with crowded, concealed punctures. Rostrum long, basal half with a median carina and dense squamiferous punctures, elsewhere shining and with minute punctures. Antennae inserted slightly nearer base than apex of rostrum, second joint of funicle longer than first. Prothorax distinctly transverse, sides rounded from middle to apex; with a feeble remnant of a median carina; with large, round, deep punctures, each containing a dark seta. Scutellum distinct and slightly elevated. Elytra not much but distinctly wider than prothorax, parallel-sided to beyond the middle, base trisinuate, shoulders clasping prothorax; with regular rows of large, round, deep punctures, mostly larger than on prothorax, and becoming oblong-elliptic on sides. Mesosternal receptacle elongate, U-shaped, almost open posteriorly. Under-surface with crowded punctures, larger on metasternum and two basal segments of abdomen than on the rest of abdomen; basal segment flat in middle. Legs long, femora minutely dentate. Length, 8–9 mm.

♀ Differs in having the rostrum longer, less of its base clothed, antennae inserted even nearer base of rostrum, basal segment of abdomen evenly convex, and legs somewhat shorter.

New Guinea: Manumbo (Madang district).

Darker than the preceding species and nonfasciculate. The scales are feebly congested in places, but they nowhere form distinct fascicles. At the extreme

base of the prothorax they are of the same colour as on the scutellum, but are concealed with the prothorax and elytra in close application. On the under-surface and legs they are mostly setose in character, and they are denser on the legs than elsewhere. The dentition of the femora (especially on the front pair) is very feeble, and the teeth could be easily overlooked. There is a row of minute granules on most of the elytral interstices.

GLYPTOPOROPTERUS (6).

This genus was proposed for a species (*G. asper*, from New South Wales) which differs from *Poropterus* in having the metasternal episterna distinct throughout, with the anterior triangle on each well defined. With it were associated *Poropterus sharpi* Faust and *cucullatus* Heller, from New Guinea. I have now to refer *P. echimys* Pasc., *gemmifer* Pasc., *papillosus* Heller, and *solidus* Faust, all from New Guinea, to it, and it is probable that most of the species from New Guinea that have been referred to *Poropterus* should also be referred to the same genus. The metasternal episterna are important in the subfamily, and in *Poropterus* they are completely wanting. The species of *Glyptoporopterus* are all compact, multigranulate insects, with long, unarmed femora, the hind ones of which, with few exceptions, pass the apex of elytra.

GLYPTOPOROPTERUS EPISTERNALIS sp. nov.

Black, antennae obscurely reddish. Moderately clothed with rusty-brown scales, with a few setae scattered about, but the latter becoming fairly dense on legs.

Head with crowded punctures, and a fairly large interocular impression. Rostrum almost the length of prothorax, rather wide, slightly curved, sides gently incurved to middle; with coarse, crowded punctures on basal fourth, elsewhere with much smaller but sharply defined ones. Antennae inserted slightly nearer base than apex of rostrum; two basal joints of funicle elongate, the others transverse. Prothorax slightly longer than wide, sides moderately rounded, apex about two-thirds the width of base; with rather dense, shining granules on disc and two small tubercles at apex; punctures distinct on sides but obscured elsewhere. Elytra about twice as long as wide, not much wider than widest part of prothorax, base trisinuate; with irregular granules and irregular rows of large punctures. Under-surface with crowded, partly concealed punctures; second segment of abdomen about two-thirds the length of first; third and fourth level with fifth, but below second. Femora rather long and densely punctate, hind ones slightly passing apex of elytra. Length, 6 mm.

New Guinea: Manumbo (Madang district); unique.

(6) Lea, Trans. Roy. Soc. S. Aust., 1912, p. 90.

On this species the metasternal episterna are shorter than usual, as they run out before the hind coxae are reached; the frontal triangles, however, are sufficiently distinct. The granules on the prothorax vary in size, but are all small; they are almost absent from a medioapical space, but this is bounded by distinct ones; on the inner half of each elytron the granules are mostly setiferous, and very irregular, they are compacted on slight tubercular elevations on the third and fifth interstices (three on the former, two on the latter), but form an almost regular nonsetiferous row on each of the interstices on the outer half, where the punctures are also more regular. The type is probably a female.

GLYPTOPOROPTERUS INSIGNICOLLIS sp. nov.

Black, antennae reddish, club infuscated. Densely clothed with more or less brown scales, the pronotum with a narrow, median stramineous vitta, followed by a wide, velvety, sooty-brown patch, extending almost to each side.

Head with punctures concealed by clothing, with two small shining processes on forehead. Rostrum moderately curved, about the length of front tibiae, basal half with moderately coarse, crowded punctures, and remnants of irregular ridges, elsewhere with smaller punctures, becoming very small about apex. Antennae inserted one-third from apex of rostrum, first joint of funicle distinctly longer than second, none of the others transverse. Prothorax about as long as its greatest width, sides feebly increasing in width from base to middle, and then rapidly decreasing in width to apex, which is obtusely rounded; punctures almost concealed; with sparse granules on disc, more numerous on sides. Elytra not much wider than prothorax, and not twice as long, base truncate, except for a trigranulate process clasping each hind angle of prothorax; with irregular rows of large punctures; with numerous granules, including some on tubercles. Under-surface with punctures almost concealed. Legs long and thin, hind femora passing apex of elytra. Length, 9 mm.

Territory of New Guinea: Wau Creek (W. W. Weidenbach); unique.

The velvety pronotum, with a conspicuous median line and sparse granules, gives this species a striking appearance, very different from all others of the genus before me, but in all essential features it is a normal member of *Glyptoporopterus*. Of the small, shining processes on the head of the type the one on the left is a narrow, oblique carina, on the right it is a feebly elevated granule. The outer margins of the pronotum, as viewed from above, appear to be pentagonal; from above only about fourteen small granules are visible, but they are fairly numerous on the middle of each side. On the elytra the granules are very irregularly disposed, and vary considerably in size; they are also present on the tubercles; of these there are eight in two transverse series, on approximately the

third and fifth interstices, the first series at the basal fourth, the second crowning the long apical slope; the largest tubercle, which is about the size of the head, is the second one on the third interstice, the most prominent one the first on the fifth interstice; the shoulders might also be regarded as tuberculate.

NEOMYSTOCIS (7) MADANGENSIS sp. nov.

Black, antennae obscurely reddish. Moderately densely clothed with rusty-brown or ochreous scales, obscurely variegated with darker ones.

Head with crowded, concealed punctures, and a narrow interocular impression. Rostrum moderately thin and gently curved, fully the length of prothorax, with coarse, crowded punctures on sides near base, elsewhere with rather sparse and small ones. Antennae inserted slightly nearer base than apex of rostrum, two basal joints of funicle elongate, the four apical ones transverse. Prothorax moderately transverse, basal two-thirds evenly rounded and then strongly narrowed to apex, with large and medium-sized partly concealed punctures; with a small remnant of a median carina, and with two briefly setose tubercles at apex, and four across apical third. Scutellum distinct. Elytra about one-fourth wider than prothorax, parallel-sided to beyond the middle; base conspicuously trisinuate; with rows of large, partly concealed punctures, some of the interstices with small granules, the third with four distinct equidistant tubercles, of which the third, crowning the apical slope, is the largest, and the following one the smallest, fifth interstice also with four but somewhat smaller tubercles. Under-surface with crowded punctures; basal segment of abdomen evenly convex. Length, 9 mm.

New Guinea: Manumbo (Madang district); unique.

With a rougher appearance and somewhat stouter legs than the three Australian species of the genus; but as the eyes are finely faceted, the rostrum long, the scutellum distinct, the mesosternal receptacle widely open, and the hind femora pass the apex of elytra, it apparently should be referred to *Neomystocis;* it is the first to be recorded from beyond Australia. At first glance it appears to belong to *Hyparinus*, but the widely open receptacle at once separates it from that genus. The legs are rather densely setose, but setae, except on the tubercles, are almost absent from the upper-surface. The type is probably a female.

MICROCRYPTORHYNCHUS (8).

Only three species of this genus have previously been named, all from Australia; but others occur on various Pacific islands, and in addition to those here dealt with probably many more remain to be described, as they are all small,

(7) Lea, Pro. Linn. Soc. N.S. Wales, 1905, p. 242.
(8) Lea, Proc. Roy. Soc. Vic., 1907, p. 194.

slow-moving, and could easily escape observation, as they usually occur on moss-covered branches (living or dead) in thick forests; others may be sieved from fallen leaves or moss.

MICROCRYPTORHYNCHUS EVANESCENS sp. nov.

Dull reddish-brown, antennae, rostrum, and tarsi paler. Moderately clothed with muddy-grey scales, interspersed with a few erect or sloping setae.

Rostrum moderately long and wide, basal half squamose, elsewhere naked and with distinct punctures. Prothorax slightly longer than wide, sides gently rounded in middle; with crowded punctures traceable through clothing. Elytra elongate-cordate, sides nowhere parallel, and widest at about basal third; with regular rows of large, deep punctures, partly obscured by clothing. Legs comparatively long and thin. Length, 1·2 mm.

Queensland: Yorke Island (C. T. McNamara); Atherton (Dr. E. Mjöberg).

Narrower than any of the previously named species. The setae are moderately long and evenly distributed, but more conspicuous at the apex of prothorax than elsewhere; they nowhere form fascicles.

MICROCRYPTORHYNCHUS NORFOLCENSIS sp. nov.

♂ Black, tips of rostrum and club obscurely reddish, rest of antennae paler. Densely clothed with muddy-brown scales, interspersed with stout, erect setae.

Rostrum with series of large concealed punctures almost to apex, only the tip glabrous. Prothorax moderately transverse, sides evenly rounded to subapical constriction; with crowded, concealed punctures. Elytra elongate-subcordate, widest about middle, where they are about one-fourth wider than prothorax; with regular rows of large, deep, normally concealed punctures. Two basal segments of abdomen depressed in middle; with crowded, partly concealed punctures. Length, 1·5–2·0 mm.

♀ Differs in having the rostrum longer and thinner, clothed only to near middle, antennae inserted not quite as close to the apex, and abdomen evenly convex.

Norfolk Island (A. M. Lea); abundant.

Close to *M. pygmaeus*, but slightly more convex and less parallel-sided. In general appearance it is strikingly like species of *Poropterus* of the *lithodermus* group, on a greatly reduced scale. The clothing is very dense but readily abraded, and is more greyish on some specimens than on others; the setae on the elytra are confined to the alternate interstices.

MICROCRYPTORHYNCHUS RUFIMANUS sp. nov.

Black, apical half or less of rostrum, antennae, and tarsi reddish. Densely clothed with muddy-grey scales, variegated with brown; with rather short setae scattered about, and on the elytra confined to the alternate interstices.

Rostrum clothed on basal half on male, less on female. Prothorax almost as long as median width, sides moderately rounded; with crowded punctures, faintly traceable through clothing. Elytra elongate-cordate; with regular rows of large, deep punctures, appearing much smaller through clothing. Length, 1·1–1·7 mm.

Norfolk Island (A. M. Lea); abundant in rotting leaves and on dead twigs.

Differs from the preceding species in being smaller, somewhat narrower; prothorax less transverse and with basal markings; these consist of four brownish spots, of which one on each side is concealed from above; the pronotum also sometimes has a pale median line. Across the middle of the elytra there are usually also four dark spots, and two nearer the apex, but the spots are often feeble or absent, whilst occasionally they are all conjoined. The female has less of the rostrum clothed and the abdomen more convex than on the male. On one specimen the dark scales on the pronotum cover most of the disc, each side (except for a spot) being almost fawn-coloured; its elytral clothing is also mostly dark, except for the suture and some subhumeral and submedian vittae. Another specimen has the clothing on the pronotum dark, except for a pale median line and a sublateral spot near apex; on the elytra its pale scales are almost confined to a large subtriangular patch. There are many other slight varietal forms.

MICROCRYPTORHYNCHUS HOWENSIS sp. nov.

Dark brown, rostrum and antennae paler. Densely clothed with pale greyish or fawn-coloured scales, variegated with brown; with fairly numerous, rather short, erect setae scattered about, and on the elytra confined to the alternate interstices.

Rostrum with about basal half clothed on male, less on female. Prothorax slightly longer than wide, its punctures and those of elytra as described in preceding species. Length, 1·0–1·5 mm.

Lord Howe Island (A. M. Lea and wife); abundant on dead and moss-covered twigs, etc.

Thinner than the preceding species, with somewhat similar but narrower prothoracic markings, and elytral markings, when present, nearer the base. The antennae are almost flavous. On the pronotum there are usually four dark spots, an elongate basal one on each side of the middle (defining a pale median line), and a feeble one on each side (not visible from above); on the elytra before

the middle there are usually four dark spots, sometimes conjoined to form an incomplete fascia; on some specimens the elytral clothing is mostly of a rather pale brown, with four paler spots (one on each shoulder and two near the suture beyond the middle). On an occasional specimen the scales are almost entirely pale, and the markings tend to disappear on slight abrasion.

MICROCRYPTORHYNCHUS OREAS sp. nov.

Black and obscurely reddish, rostrum, antennae, and tip of abdomen and tarsi distinctly reddish. Densely clothed with muddy-brown or brownish-grey, obscurely variegated scales, and with short, upright setae.

Rostrum clothed on basal half on male, longer and less clothed on female. Prothorax moderately transverse, sides evenly rounded to subapical constriction; with crowded, normally concealed punctures. Elytra elongate-subcordate, widest just before middle; with regular rows of large punctures, appearing small through clothing (or quite concealed). Length, 1·5–1·8 mm.

Lord Howe Island: Summit of Mount Gower (A. M. Lea and party); seventeen specimens.

Slightly narrower, but otherwise as on *M. norfolcensis*. Some parts on abrasion are seen to be decidedly black, the same parts on others are brownish or reddish; usually the metasternum and abdomen are black, but usually the clothing is so dense that the derm is concealed. One specimen (probably immature) is almost entirely reddish; it is rather badly abraded, but has two small spots of black scales close together at the summit of the apical slope.

MICROCRYPTORHYNCHUS RUFIROSTRIS sp. nov.

Reddish-brown, rostrum and tarsi paler. Upper-surface densely clothed with uniform greyish-white scales, under-surface almost glabrous, except for clothing on the third and fourth abdominal segments; with rather sparse and short, sloping setae.

Rostrum about the length of prothorax, basal third squamose, elsewhere shining and with minute punctures. Antennae inserted slightly nearer base than apex of rostrum. Prothorax almost as long as wide, sides gently rounded to subapical constriction, a shallow depression across apical third; with crowded, concealed punctures. Elytra the width of prothorax at base, sides very feebly dilated to about the middle; with rows of large, almost concealed punctures; third, fifth, and seventh interstices slightly elevated. Metasternum and abdomen with sharply defined punctures. Length, 1·2 mm.

Lord Howe Island: Mount Gower (A. M. Lea and party); three specimens.

A rather narrow, subparallel-sided species, with walls of mesosternal receptacle thinner than usual, but of the usual U-shape. The slight elevation of the

odd interstices causes the elytra to appear feebly vittate, although their clothing is of the same shade as on the adjacent parts.

MICROCRYPTORHYNCHUS INTERRUPTUS sp. nov.

Dark reddish-brown, rostrum and tarsi paler, antennae (club excepted) still paler. Irregularly clothed with brownish and greyish scales, under-surface sparsely clothed.

Rostrum slightly shorter than prothorax, basal two-fifths squamose, elsewhere shining and with minute punctures. Antennae inserted about two-fifths from apex of rostrum. Prothorax almost as long as wide, sides moderately rounded, base incurved to middle; with crowded, partly concealed punctures. Elytra elongate-cordate, widest at about basal third; with regular rows of large, partly concealed punctures. Under-surface with sharply defined punctures, denser on metasternum than elsewhere. Length, 1·8 mm.

Lord Howe Island: Summit of Mount Gower, on tree moss (A. M. Lea); unique.

Distinct from all previously described species by the elytral clothing. Much of the clothing of the prothorax is brownish, but there is a fairly wide and irregular pale vitta on each side; there is a conspicuous pale vitta on each elytron, beginning at the base on the fourth interstice, it is interrupted at the middle, and is then continued on the third almost to the apex; there are remnants of other vittae on the sides. There are a few inconspicuous setae at the apex of prothorax and on the apical slope of elytra. Parts of the elytra and of the under-surface are almost black.

MICROCRYPTORHYNCHUS FASCICULATUS sp. nov.

♂ Black or blackish-brown, part of rostrum, antennae, and tarsi paler. Densely clothed (except on parts of under-surface) with pale, rusty-brown or greyish scales. With numerous erect or suberect setae, in places condensed to form fascicles.

Rostrum with apical fourth glabrous, and with small, dense punctures; elsewhere densely clothed. Antennae inserted about two-fifths from apex of rostrum. Prothorax slightly transverse, sides and middle of base rounded; with large, crowded, concealed punctures. Elytra oblong-cordate, base strongly incurved at scutellum; shoulders clasping base of prothorax; with regular rows of large, concealed punctures. Metasternum and two basal segments of abdomen with crowded punctures, the two basal segments flat in middle. Length, 1·5–2·0 mm.

♀ Differs in having the rostrum slightly longer and thinner, about half of it glabrous, antennae inserted less close to apex, and abdomen evenly convex.

Lord Howe Island, including summit of Mount Gower (A. M. Lea and party).

A compact, fasciculate species, with clothing so dense that the derm is almost everywhere concealed; it is uniformly coloured on the individual, but varies on different specimens from almost greyish-white to a rather dark rusty-brown. The fascicles are loosely compacted and easily abraded or disarranged, but on specimens in good condition there are six on the prothorax (two at apex and four across middle) and three on each elytron (one near the shoulder and two on the third interstice); the setae composing them are usually of the same colour as the adjoining scales, but occasionally some of them are blackish. The prothorax, as viewed from the sides, appears to have a deep subapical notch; this is partly due to a slight depression there, but mostly to the setae or fascicles clothing the apical and submedian parts.

Many specimens were obtained from dead and living moss-covered twigs and from moss and fallen leaves. The specimens (twenty-three) from the summit of Mount Gower are darker, and the average size is slightly greater than the others taken on the island.

MICROCRYPTORHYNCHUS SETOSUS sp. nov.

♂ Blackish, rostrum and tarsi obscurely diluted with red, antennae almost flavous. Densely clothed with muddy-brown or greyish scales, interspersed with numerous long, erect setae.

Rostrum moderately long and feebly curved, apical fourth glabrous and with conspicuous punctures, elsewhere densely clothed. Antennae inserted about one-third from apex of rostrum. Prothorax almost as long as the greatest width (which is at about the basal third), sides rather strongly rounded; with crowded and rather large punctures, slightly indicated through clothing. Elytra elongate-cordate, sides strongly rounded and widest at about basal third; with regular rows of large, deep punctures, wider than interstices, but appearing smaller through clothing. Metasternum and two basal segments of abdomen with coarse, crowded, partly concealed punctures, the two basal segments flat in middle. Legs comparatively long and thin. Length, 2·5–3·0 mm.

♀ Differs in having the rostrum longer, thinner, less clothed, antennae inserted more distant from its apex, and abdomen evenly convex.

Norfolk Island (A. M. Lea); seven specimens from moss and fallen leaves.

The largest known species of the genus. The clothing on the under-surface is less dense than on the upper-surface, but on the mesosternal and metasternal episterna it is denser and paler than elsewhere, appearing vittate. The setae are long and numerous on the legs and base of rostrum, as well as on the upper-surface; they do not form fascicles, except that on the third interstice on each

elytron, at the basal fourth, there is a small spot of black scales, with black setae more numerous than usual; there are usually also two small clusters of whitish setae at the base. The scales are sometimes variegated on the legs. A single specimen from Lord Howe Island probably belongs to the species, but differs from the others in having the scales on the elytra almost black.

MICROCRYPTORHYNCHUS ROTUNDIPENNIS sp. nov.

Black, antennae and tarsi red. Densely clothed with muddy-brown or greyish scales; interspersed with erect, clavate setae.

Rostrum with tip glabrous and punctate, elsewhere densely clothed. Antennae inserted about one-third from apex of rostrum. Prothorax slightly transverse, sides rather strongly rounded; punctures crowded but normally concealed. Elytra cordate, sides strongly rounded; with regular rows of large, deep punctures, appearing much smaller through clothing. Under-surface with crowded, mostly concealed punctures. Length, 2 mm.

Fiji: Ovalau, Viti Levu, Mokondronga (A. M. Lea).

Largest of all the Fijian species, and larger than any other known species except the preceding one. The sides of the elytra are more strongly rounded than usual. The club and scape are almost flavous and paler than parts of the funicle. There are four lines of setae on the rostrum and front of head, but they are paler and shorter than those elsewhere. The pronotum as seen from above appears to be depressed near apex, but from the sides the depression is seen to be due mostly to the long setae; these are numerous at the apex, then absent for a short distance, and then again numerous. The scales at its extreme base are white, but are normally almost concealed, when it is in close contact with the elytra. Where the clothing has been removed from the elytra the punctures are seen to be large and considerably wider than the interstices, but with the clothing in perfect condition they are scarcely traceable. The four specimens taken appear to be all males.

MICROCRYPTORHYNCHUS ANGUSTIOR sp. nov.

Black, antennae obscurely reddish. Densely clothed with muddy-brown scales, interspersed with short, stout, erect setae.

Rostrum rather wide, apical portion glabrous and with numerous conspicuous punctures. Prothorax about as long as its greatest width, sides rather strongly rounded; with crowded, concealed punctures. Elytra elongate-cordate, sides rather strongly rounded, base evenly incurved to middle; with regular rows of large, partly concealed punctures. Metasternum and two basal segments of abdomen with coarse punctures. Length, 2 (vix) mm.

Fiji: Viti Levu (A. M. Lea).

Slightly smaller and distinctly narrower than the preceding species. On the type about one-third of the rostrum is glabrous, on two others about half is glabrous, but a few scales in front probably indicate partial abrasion, so the specimens may be all males. The setae are numerous at apex of prothorax and across middle; on the elytra they are confined to the odd interstices, and appear to form two feeble fascicles on the third on each elytron.

MICROCRYPTORHYNCHUS VITIENSIS sp. nov.

♂ Black, glabrous portion of rostrum and tarsi reddish, antennae (club excepted) almost flavous. Densely clothed with muddy-brown or brownish-grey scales, interspersed with stout, erect setae.

Rostrum with apical fourth glabrous and with distinct punctures, elsewhere densely clothed. Prothorax slightly longer than wide, sides moderately rounded; punctures crowded but normally almost concealed. Elytra elongate-subcordate, base almost truncate; with rows of large, deep, partly concealed punctures. Metasternum and two basal segments of abdomen with crowded and rather coarse punctures. Length, 1·2–1·5 mm.

♀ Differs in having rostrum slightly longer, about half of it glabrous and with somewhat smaller punctures, antennae inserted near the middle of rostrum instead of about apical third, and abdomen more convex.

Fiji: Ovalau (in June), Viti Levu, Taveuni (A. M. Lea).

A minute species, structurally close to *M. rufimanus* and *howensis*, from Lord Howe Island, but with very different clothing; it is fairly close to the preceding species, but is smaller and narrower. On the pronotum the setae are most numerous at the apex, on the elytra they are confined to the odd interstices, and they are numerous on the legs.

MICROCRYPTORHYNCHUS CALEDONICUS sp. nov.

Dark brown, parts of under-surface almost black, antennae almost flavous. Densely clothed with greyish-brown scales, interspersed with stout, erect setae.

Rostrum rather wide, apical half glabrous and with sharply defined punctures, basal half squamose and setose. Antennae inserted almost in exact middle of sides of rostrum. Prothorax almost as long as wide, sides moderately rounded; with crowded, normally concealed punctures. Elytra subcordate, base truncate, sides widest at about basal third; with regular rows of large punctures, appearing much smaller through clothing. Metasternum and two basal segments of abdomen with crowded punctures. Length, 1·2 mm.

New Caledonia: Noumea (A. M. Lea); unique.

A minute species, fairly close to the preceding one, from Fiji, but prothorax shorter and clothing not quite the same. The type is probably a female, although the rostrum appears rather wide for a member of that sex.

SALCUS CIRCULARIS n. sp.

Black, antennae reddish. Moderately clothed with rusty-brown scales, becoming sparser on under-surface, including front of pectoral canal, but metasternal triangles densely clothed; pronotum with four small whitish spots across middle, elytra with two at base.

Rostrum slightly shorter than prothorax, gently curved, with irregular rows of squamiferous punctures to near apex, where they are crowded and naked. Antennae inserted about two-fifths from apex of rostrum; two basal joints of funicle elongate, the three apical ones transverse. Prothorax more than twice as wide as long, sides strongly rounded, apex slightly produced; with rather dense setiferous punctures, about as large as on base of rostrum. Elytra slightly wider than long, base truncate, except that shoulders slightly clasp base of prothorax; with large punctures in irregular rows. Two basal segments of abdomen with a few large punctures, the suture between them feeble in middle, with an elliptic fovea on each side. Legs long; femora grooved, front ones strongly dentate, the others almost edentate. Length, 4·5 mm.

Queensland: Dayboro, in January (H. Hacker). Type (unique), in Queensland Museum.

The smallest and widest species of the genus, with an even more circular outline than that of *S. latissimus*.

Some AUSTRALIAN DECAPOD CRUSTACEA

By HERBERT M. HALE, Curator, South Australian Museum.

Text figs. 19-27.

In dealing with the South Australian Decapoda in a recent handbook (1) some necessary corrections were made, but reasons for these alterations, and for apparent omissions, are not obvious in all cases. In this connection some of the notes in the present paper may be regarded as supplementary. A number of the Crustacea dealt with in the handbook had not hitherto been figured, and some had not been previously listed for South Australia. The mention of the last-named therein will serve as a record of occurrence. South Australian specimens of such species are housed in the Museum.

Tribe CARIDEA.

In 1863 Spence Bate described and figured six species of the Caridea from St. Vincent Gulf, South Australia; three of these species were collected and identified by me during recent years, but the other three, namely, *Caradina cincinnuli (Hippolyte cincinnuli)*, *Angasia pavonina (Tozeuma pavoninum)*, and *Crangon intermedius (Pontophilus intermedius)*, were not recognized. In view of the fact that S. Bate's diagnoses are not dependable, it was considered significant that, while three species closely allied to the three named occur in the Gulf, specimens corresponding with Bate's descriptions and figures did not appear in the dredge. Dr. W. T. Calman, on request, very kindly re-examined Bate's types of these species in the British Museum, and I am indebted to him for notes regarding them.

Family HIPPOLYTIDAE.

Hippolyte Leach.

Hippolyte australiensis (Stimpson).

Virbius australiensis Stimps., Proc. Acad. Sci., Philad., 1860, p. 35; Hasw., Cat. Aust. Crust., 1882, p. 186.

Caradina cincinnuli S. Bate, Proc. Zool. Soc., 1863, p. 500, pl. xl, fig. 3.

Caridina cincinnuli Hasw., *loc. cit.*, p. 183.

Hippolyte australiensis Kemp, Rec. Ind. Mus., x, 1914, p. 98, pl. ii, fig. 6; Hale, Crust. South Aust., pt. i, 1927, p. 50, fig. 42.

(1) Hale, The Crustaceans of South Australia, part i, Aug. 13, 1927, pp. 1-201, fig. 1-202.

According to Bate's figures, *Caradina cincinnuli* differs from *Hippolyte australiensis* in the following characters: (a) the second segment of the carpus of the second legs is about as long as the third joint; (b) there is no supra-orbital spine; (c) the anterior pair of telsonic spines is placed posterior to the middle of the length of telson. The accompanying camera lucida figures (drawn by Dr. Calman) of one of the syntypes of *Caradina cincinnuli* show that these differences are apparent only in Bate's illustrations, and that the two species are synonymous.

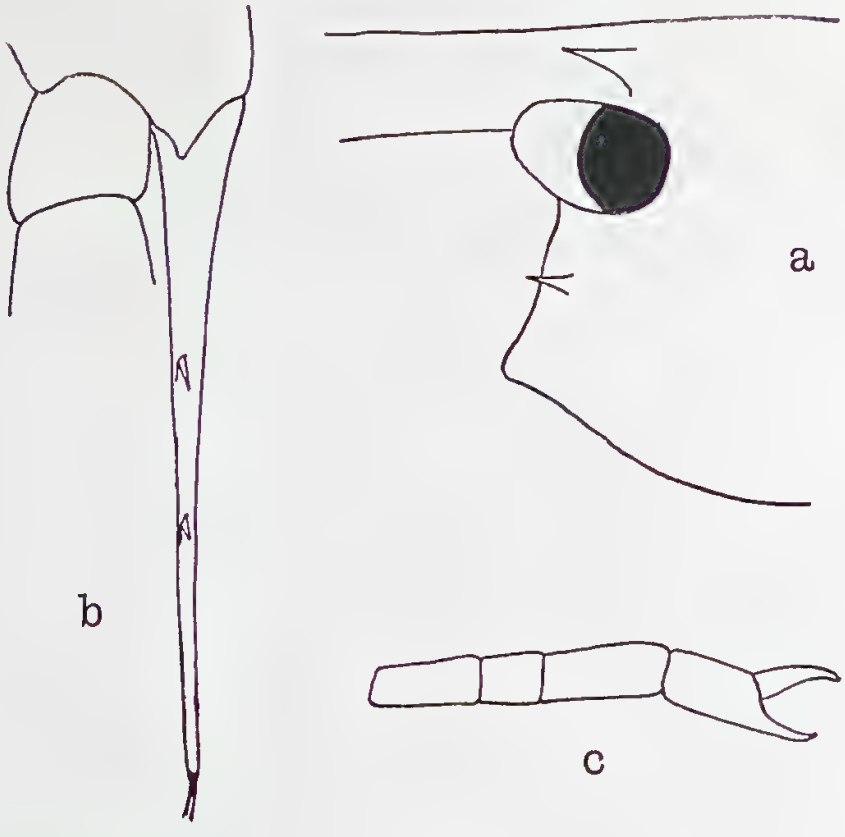

Fig 19. Syntype of *Caradina cincinnuli* Bate; *a*, anterior part of carapace; *b*, telson; *c*, wrist and hand.

Before me are examples of *H. australiensis* from New South Wales, South Australia, and Western Australia; the species is not uncommon in St. Vincent Gulf. The rostrum has no teeth on the upper margin, but on the lower side is produced into a thin keel, which is usually cut into four to six teeth, but in rare cases (Hale, *ut supra*, fig. 42) only two ventral incisions are apparent. Specimens captured on weed were green in colour during life, marked with brown.

LATREUTES TRUNCIFRONS (S. Bate).

Caradina truncifrons S. Bate, Proc. Zool. Soc., 1863, p. 499, pl. xl, fig. 2.
Caridina truncifrons Hasw., Cat. Aust. Crust., 1882, p. 183.
Latreutes truncifrons Hale, Crust., South Aust., pt. i, 1927, fig. 44.

This curious little prawn lives amongst the sea-grasses in St. Vincent Gulf, and like other of the small crustaceans from this situation is usually yellowish-green or graminaceous in colour. The truncate rostrum of the female is considerably variable; the front margin is often more or less oblique, forming an

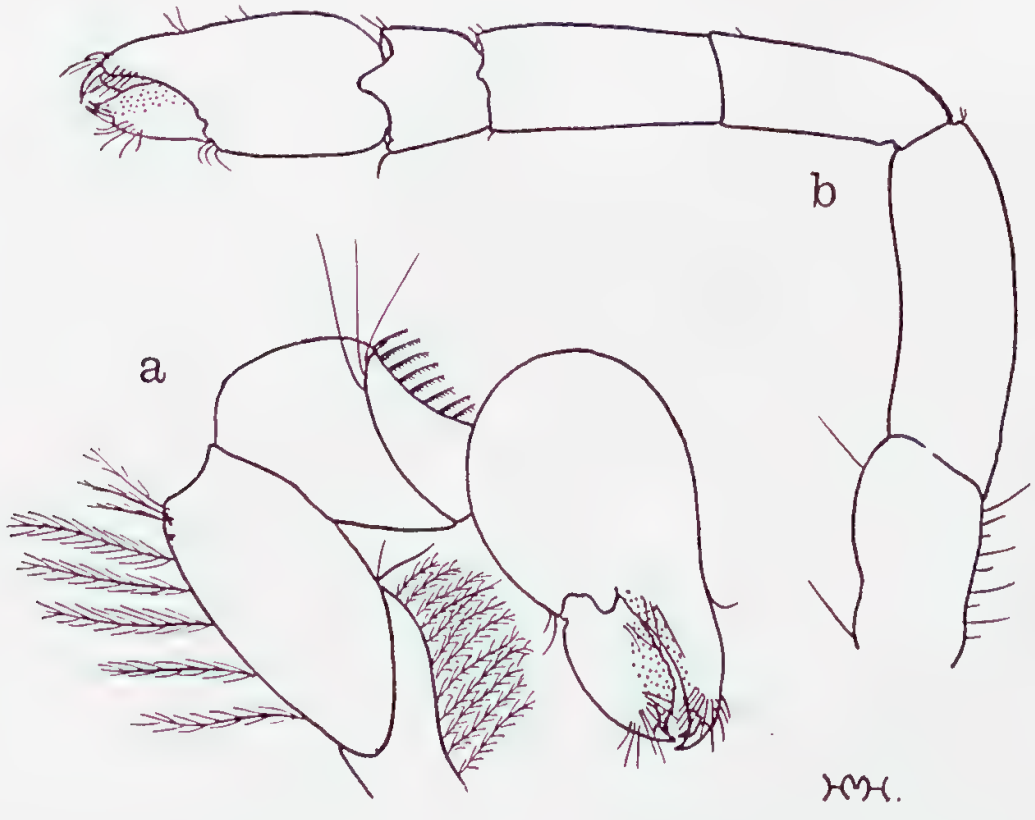

Fig. 20. *a*, First leg; *b*, second leg, of *Latreutes truncifrons* (× 50).

obtuse angle with the dorsal margin. The serrations of this front edge are inconstant, and may be almost or quite absent, even and acute, or jagged and irregular. The single median, dorsal spine behind the rostrum varies in position, and may be in advance of, or behind, the vertical level of the eye; there are sometimes one or two small spinules on the median dorsal line in addition to the spine. The carapace is often smooth, but in some cases the dorsum has more or less distinct incisions set with tufts of hairs; the pleon of such examples also often bears hair tufts. The arm of the first peraeopods is longer than the wrist and shorter than the hand, which is much longer than the wrist (24 : 15); the dactylus is shorter than the palm. In the second legs

the arm is as long as the second and third joints of the wrist together and slightly longer than the hand; the proportions of the first, second, and third carpal joints are 7 : 7 : 4 (the three segments are shown as subequal in length in Bate's fig. 21); the dactylus is shorter than the palm.

Males associated with females of *L. truncifrons,* and presumably belonging to the same species, differ very considerably. The form is much more slender and the swimmerets markedly stouter; the upper flagellum of the first antennae is very much thicker and longer, and the rostrum is of entirely different shape, greatly resembling the blade of a razor. The male is rarely taken, but the female is rather common.

TOZEUMA Stimpson.

Tozeuma Stimps. 1860 antedates *Angasia* S. Bate 1863; Kemp ([2]) points out that if the spelling of *Tozeuma* be amended to *Toxeuma*, the name is preoccupied (Walker, 1833, Hymenoptera).

TOZEUMA PAVONINUM (S. Bate).

Angasia pavonina S. Bate, Proc. Zool. Soc., 1863, p. 498, pl. xl, fig. 1; Hasw., Cat. Aust. Crust., 1882, p. 185.

Angasia robusta Baker, Trans. Roy. Soc. S. Aust., xxviii, 1904, p. 150, pl. xxviii, figs. 1-8.

Tozeuma pavoninum Kemp, Rec. Ind. Mus., x, 1914, p. 126; Hale, Crust. South Aust., pt. i, 1927, p. 53, fig. 47; Stephensen, Videns. Medd. nat. For. Kjobenhavn, lxxxiii, 1927, p. 297.

Tozeuma robustum Kemp, *loc. cit.;* Stephensen, *loc. cit.*

Baker proposed the name *Angasia robusta* for a species common in St. Vincent Gulf because his specimens did not agree with Bate's diagnosis and figures of *A. pavonina* in five characters: (a) the form was apparently more robust; (b) the rostrum appeared of different shape, with five to seven instead of only four ventral teeth; (c) the carpus of the first peraeopods is subequal in length to the merus (not much longer than the merus, as shown in Bate's fig. 1 k); (d) the second pair of legs were apparently of different shape, with the segments not as illustrated by Bate; (e) the telson terminates in four spines.

Dr. Calman states (in litt.) that there are two syntypes of *Angasia pavonina,* and that he is unable to indicate a single difference between them and a specimen of Baker's species except that the rostrum has only four teeth below, Bate's figures of the legs being wholly inaccurate. There is therefore little doubt that the specimens examined by Bate and Baker should be referred to the same species.

([2]) Kemp, Rec. Ind. Mus., x, 1914, p. 105.

The joints of the first two pairs of peraeopods of one of the syntypes of *Angasia robusta* Baker are of the following proportions: The arm of the first leg is about as long as the wrist, which is much shorter than the hand (26 : 43);

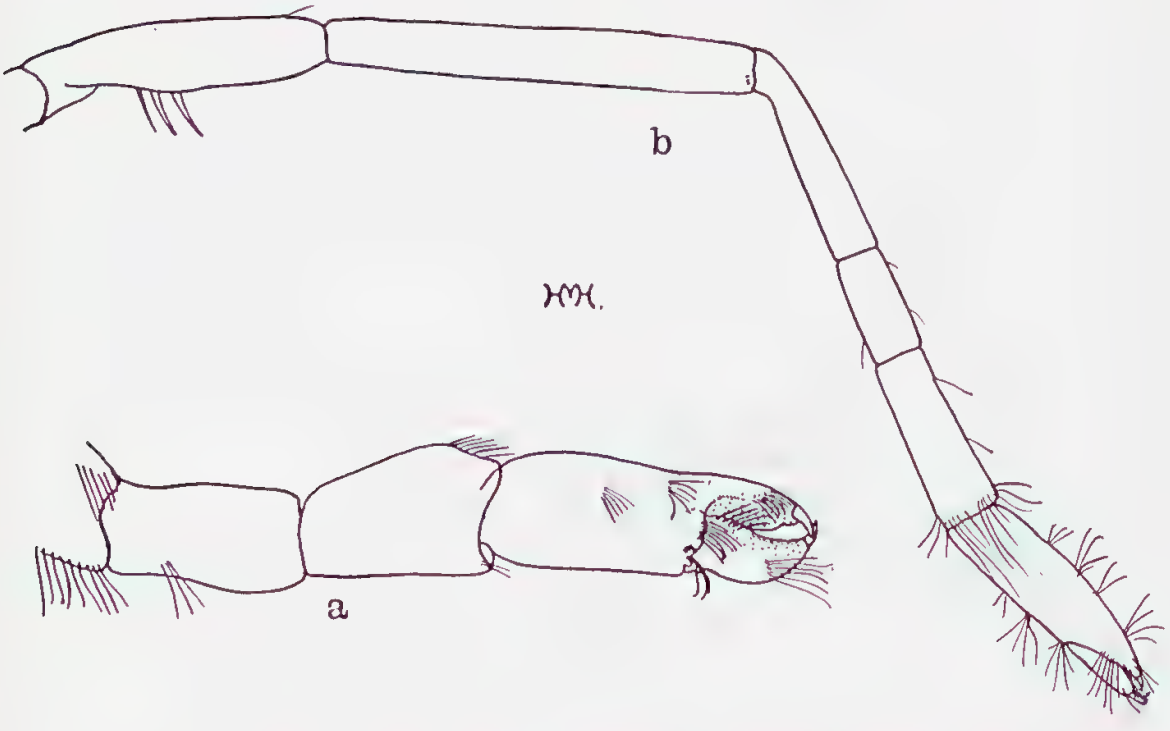

Fig. 21. *a*, First leg; *b*, second leg, of syntype of *Angasia robusta* Baker (× 19).

the fingers are short and robust, the dactylus little more than half as long as the palm. In the elongate second peraeopods the arm is shorter than the wrist (54 : 65), and the proportions of the first, second, and third joints of the carpus are 28 : 15 : 22; the hand is half as long as the wrist, with the dactylus scarcely more than half as long as the palm.

Family PALAEMONIDAE.

PERICLIMENES Costa.

PERICLIMENES AESOPIUS (S. Bate).

Anchistia aesopia S. Bate, Proc. Zool. Soc., 1863, p. 502, pl. xli, fig. 5; Hasw., Cat. Aust. Crust., 1882, p. 194.

Urocaris aesopius Borradaile, Trans. Linn. Soc., (2) xvii, 1917, p. 354.

Periclimenes aesopius Kemp, Rec. Ind. Mus., xxiv, 1922, p. 142, fig. 12; Hale, Crust. South Aust., pt. i, 1927, p. 56, fig. 50.

Kemp redescribes Bate's two syntypes, and remarks that the species "has apparently not been rediscovered during the past fifty years." Recently, however, we have secured a few examples of this free-living prawn in St. Vincent

Gulf. The salient feature of the animal, namely, the tooth-like hump of the hinder part of the third pleon segment (alluded to in the specific name) is figured by Kemp. During life the thicker outer lash of the first antennae is held perpendicularly and the other flagellum horizontally forwards; the long lash of the second antennae is directed backwards most of the time. The creature is extremely transparent, and were it not for a few colour markings would be practically invisible when viewed in the water. On the upper side of the carapace and rostrum is a series of nine to eleven red dots, one at the base of each dorsal tooth, and behind these is a pair of looped red lines, enclosing a white marking. There are a few other small markings on the carapace. The legs and antennae are for the greater part banded or streaked with red; the larger chelipeds are banded with lilac, and the chelae are tipped with red. The first three pleon segments bear a red line margining the whitish dorsum, and have an ocellus and a short red bar on the extremities of the pleural flaps; the base of the tail-fan is banded with brilliant red.

The species attains a length of 25 mm.

Family CRAGONIDAE.

PONTOPHILUS Leach.

PONTOPHILUS INTERMEDIUS (S. Bate).

Crangon intermedius S. Bate, Proc. Zool. Soc., 1863, p. 103, pl. xli, fig. 6; Hasw., Cat. Aust. Crust., 1882, p. 181.

Pontophilus intermedius Hale, Crust. South Aust., pt. i, 1927, p. 62, fig. 60.

Bate states that in the holotype of this species there is "a row of minute denticles extending from the extraorbital tooth posteriorly between the cardiac and branchial regions." His figure shows nine of these denticles on the left and fourteen on the right side, while one median spine is shown behind the rostrum. Dr. Calman states that the type, which is small, has two teeth on the median dorsal line and a row of four large spines behind the supraorbital spine. Were it not known that other of Bate's work shows great inaccuracy one could scarcely believe that the holotype is correctly labelled.

Examples taken in St. Vincent Gulf vary somewhat *inter se*. As noted above, there is a row of four distinct spines behind the spine at the outer angle of the orbit. Each antero-lateral angle of the carapace bears a spine, posterior to which are one to three (usually two) spines; between the two rows is an hepatic spine. There is a median dorsal carina on the carapace, fading away posteriorly, and cut into one large tooth anteriorly, while sometimes there is a smaller tooth behind the first; the pleon bears a low median ridge. The example

figured (Hale, *ut supra*) was exquisitely coloured during life as follows: Cornea of eyes white, with a pale blue centre. Dorsal surface of bases of antennae, of the first legs, carapace, and abdomen almost to end of fourth segment, mottled in imitation of the pale grey sand of the Gulf bottom. Dorsum of hinder part of fourth pleon segment brilliant red; three velvety black marks on anterior part of fifth segment. Sides of body, remainder of upper-surface, legs, and swimmerets variable, purple, reddish, or yellow, with numerous small dots. Ova dull yellow. The largest example of the species examined is 45 mm. in length.

PONTOPHILUS INTERMEDIUS var. VICTORIENSIS Fulton & Grant.

Pontophilus victoriensis Fulton & Grant, Proc. Roy. Soc. Viet., xv, 1902, p. 65, pl. x, fig. 2.

Other specimens of *Pontophilus* from the Gulf differ from the foregoing in having the median dorsal carina of the carapace longer and cut into three teeth; these correspond to *P. victoriensis* Fulton & Grant. In some of these examples the three median teeth are strong, but in others the second and third teeth are much smaller and weaker than the first. I have therefore tentatively placed *P. victoriensis* as a variety of *P. intermedius.*

P. flindersi Fulton & Grant has also been taken in South Australian waters (Encounter Bay, Dr. R. H. Pulleine).

Tribe HIPPIDEA.

Family HIPPIDAE.

HIPPA AUSTRALE Hale.

Hippa australe Hale, Crust. South Aust., pt. i, 1927, p. 97, fig. 94.

♂ Carapace oval, the length slightly more than one and one-half times greatest width; dorsum marked with numerous short, crenulate incisions, from which emanate short, adpressed bristles. Frontal margin wide, crenulate, very obscurely trilobed, the wide, median angular projection extremely obtuse. Eyes small and slender. External portion of second joint of second antennae produced outwards and forwards, reaching beyond distal end of third segment. First legs elongate, about as long as carapace, with the penultimate segment two-fifths as long as the antepenultimate and shorter than the last segment. Telson narrowly triangular, acute, with a median longitudinal depression; short grooves at base very divergent. Length of carapace, 11·5 mm.; length of telson, 8·5 mm.

Loc. South Australia: Corney Point, Spencer Gulf (Mrs. Isabella Klem, 1926). Type in South Australian Museum, Reg. No. C. 994.

Unfortunately, only an incomplete exoskeleton of this species is before me; this was picked up on the beach at the mouth of Spencer Gulf. The outer maxillipeds and first legs are as in the widely distributed *H. adactyla* Fabr., but the shape of the front, the sculpturing of the carapace, and the second antennae are entirely different; also the two short grooves at the base of the telson are more divergent. The incisions are arranged, somewhat irregularly, into an oblique series towards the anterior part of each side of the carapace, but in no way do these resemble the continuous and well-defined series of striae as in *H. adactyla*. Our species is apparently close to *H. truncatifrons* Miers, with which it agrees in the absence of a regular series of lateral striae. Miers' species, however, has the "frontal margin straight, entire, smooth," while no mention is made of sculpture of the carapace.

While the above notes were in press Mr. Serventy kindly sent me two specimens from Cottesloe, Western Australia, which are identical with this species. These were collected some years ago by Mr. Glauert; the last-named sent examples to Dr. Calman, who identified them as *Remipes truncatifrons* Miers. In view of this determination it is probable that the differences suggested to me by Miers' description do not exist, and that *H. australe* is identical with the Chinese species.

Tribe **BRACHYGNATHA.**

Family HYMENOSOMATIDAE.

HALICARCINUS White (1846).

HALICARCINUS NUYTSI Hale.

Halicarcinus nuytsi Hale, Crust. South Aust., pt. 1, 1927, p. 118, fig. 116.

♀ Carapace subcircular, scarcely longer than wide, slightly emarginate at the bases of the last pair of legs; margin entire and a little upturned; rostrum absent; upper-surface with well-defined grooves, sunken but with low swellings (as shown in fig. 116, *ut supra*), and clothed with tiny, well-separated hairs. A spine above the bases of the first pair of walking legs, and another (fig. 22) on each pterygostomian region in front of the chelipeds. First antennae separated at their bases by a tooth which is directed upwards and forwards. Eyes small, wholly invisible in dorsal view. External maxillipeds broad, practically completely closing the buccal cavern, and with the merus as long as the ischium. Chelipeds stouter than the walking legs, clothed with short hairs, the arm and wrist unarmed; palm somewhat swollen; fingers meeting throughout their length, each with about seven low, interlocking teeth and a few smaller teeth.

Ambulatory legs slender, unarmed, and densely fringed with very short hairs; second and third pairs subequal in length, slightly longer than the others; dactyli flat, not markedly curved, narrow (dactylus of last leg eight times as long as wide), and terminating in a small spine. Colour pale brown. Length of carapace, 6 mm.

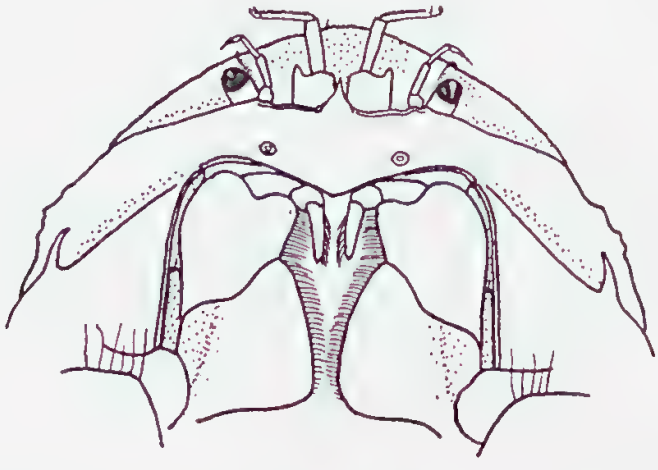

Fig. 22. *Halicarcinus nuytsi*, type female; anterior part of carapace in ventral view (× 12).

Loc. South Australia: St. Francis Island (type loc., Sir Joseph Verco). New South Wales: Collaroy and Bottle and Glass Rocks, Port Jackson (Melbourne Ward).

After the holotype was described, a small series of both sexes was taken by my friend, Mr. Ward, in New South Wales; they were discovered under stones near shore. In an adult male with a carapace 7 mm. in length the hands are more massive than in the female, with the fingers slightly bent down; the sides of the abdomen are a little concave at the penultimate segment. The spine on the pterygostomian region, and that above each of the first ambulatory legs, are not developed in some examples and in others are very small.

In the form of the maxillipeds, the character of the upper-surface of the carapace, the definite epistome, etc., this species is typical of *Halicarcinus*. The abdomen of the male has the segments distinct, the third, fourth, and fifth not being fused as in *Rhynchoplax*. There is, however, no rostrum, there being the merest suggestion of an angle at the middle of the anterior margin of the carapace.

I have associated with this little crab the name of the Hon. Pieter Nuyts, commander of the ship "t'Gulden Seepart," who discovered the south-west coast of Australia in January, 1627, and named the islands of "Sint Francois" and "Sint Pieter"; these are doubtless the oldest place-names in the State of South Australia.

Family GONEPLACIDAE.

CERATOPLAX GLABERRIMUS (Haswell).

Pilumnus glaberrimus Hasw., Proc. Linn. Soc., N.S. Wales, (1) vi, 1881, p. 544, and Cat. Aust. Crust., 1882, p. 69.

Ceratoplax punctata Baker, Trans. Roy. Soc., S. Aust., xxxi, 1907, p. 176, pl. xxiii, fig. 2; Hale, Crust. South Aust., pt. 1, 1927, p. 171, fig. 173.

Ceratoplax glaberrimus Rathbun, Biol. Res. "Endeavour," v, 1923, p. 111.

Dr. Rathbun examined Haswell's type of *Pilumnus glaberrimus*, stated that the species was properly referable to *Ceratoplax*, and that *C. punctata* was synonymous with it. After seeing the photograph of the holotype of Baker's species, reproduced in the handbook quoted above, Mr. F. A. McNeill kindly sent me a male and a female of *C. glaberrimus* from Kurnell, Botany Bay, New South Wales. The type of *C. punctata* is larger than these examples, but exhibits no specific differences. Mr. McNeill remarks that *C. glaberrimus* is not uncommon between tide marks on reefs in Botany Bay, and also occurs in 4–5 fathoms in the vicinity of the Sow and Pigs Reef in Port Jackson.

Tribe **OXYSTOMATA.**

Family LEUCOSIIDAE.

My thanks are due to Mr. F. A. McNeill, of the Australian Museum, for the opportunity of studying a male of *Cryptocnemus haddoni*, and a small *Nursia abbreviata*, from Queensland.

CRYPTOCNEMUS Stimpson, 1858.

CRYPTOCNEMUS VINCENTIANUS Hale.

Cryptocnemus vincentianus Hale, Crust. South Aust., pt. 1, 1927, p. 192, fig. 193.

♀ Carapace subpentagonal, nearly half as wide again as medianly long; very convex in lateral view, subtriangular in transverse section. Front moderately prominent, subtriangular, somewhat acutely rounded apically, and a little upturned. An obtuse, median carina extends for almost the whole length, the hinder part forming a low boss above the posterior margin. Margins not crenulate. Hepatic angles prominent and slightly obtuse. Antero-lateral margins concave, forming an obtuse angle with the much shorter postero-lateral margins, which are evenly rounded. Middle portion of posterior margin incrassate, slightly upturned, and convex in outline.

Orbits very small, situate in the angles between the sides of the front and the almost straight margins leading to the hepatic angles.

Fossae of first pair of antennae transverse.

Endopod of the third maxillipeds with the ischium longer than the triangular merus, the acute apex of which projects beyond the buccal frame, almost reaching level of hinder margin of antennulary fossae; exopod as wide as, and reaching to beyond second third of length of, merus of endopod.

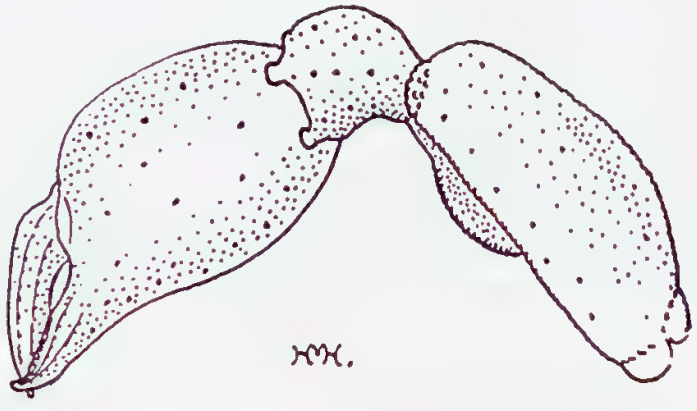

Fig. 23. Ventral view of left cheliped of *Cryptocnemus vincentianus*, type female (× 10).

Margins of arm and dorso-interior edge of the distal half of the trigonous wrist finely beaded; inner dorsal edge of arm raised in a semicircular crest. Fingers meeting for more than half their length when closed, the tips crossing; each finely serrate with two low ridges on both surfaces. Palm swollen and compressed about one-fourth times as long again as greatest width, with the dactylus as long as the palm is wide. Merus, carpus, propodus, and dactylus of peraeopods with low crests.

First segment of pleon very short, but as wide as the following segment; second to sixth segments coalesced; seventh segment short, subtriangular, scarcely longer than its basal width, and narrowly rounded apically.

Colour ivory white, with the lateral margins of the carapace and chelipeds sparsely-speckled with brown. Surface of carapace, peraeopods, and pleon slightly glabrous, closely dotted with extremely minute punctures, interspersed with which are some larger pits; the larger punctures of the chelae are for the greater part arranged in longitudinal series.

Length of carapace, 7·25 mm.; width of carapace, 10 mm.

Loc. South Australia: St. Vincent Gulf, 5 miles off Semaphore, 5 fathoms (W. J. Kimber, 1925). Type in South Australian Museum, Reg. No. C. 781.

A single specimen was dredged on a sandy bottom. This, the first species of the genus to be recorded from southern Australia, approaches *C. pentagonus* Stimpson, *C. crenulatus* Grant and McCulloch, and *C. haddoni* Calman in general shape. In the first-named, however, the lateral angles of the carapace are acute,

the crests of the palms are notched, etc.; *C. crenulatus* differs in the shape of the postero-lateral and hinder margins of the carapace, in the obtusely angular front, and in having the lateral margins crenulate. The lateral margins of the carapace of *C. haddoni* are continued on to the dorsal surface anteriorly, the posterior margin is not distinctly convex, and the front is obtusely angular.

CRYPTOCNEMUS HADDONI Calman.

Cryptocnemus haddoni Calman, Trans. Linn. Soc., viii, 1900, p. 25, pl. i, figs. 4-8; Ihle, Tijdschr. Ned. Dierk. Ver., (2) xiv, 1915, p. 64, and Res. Expl. Siboga, xxxix b2, 1918, p. 286.

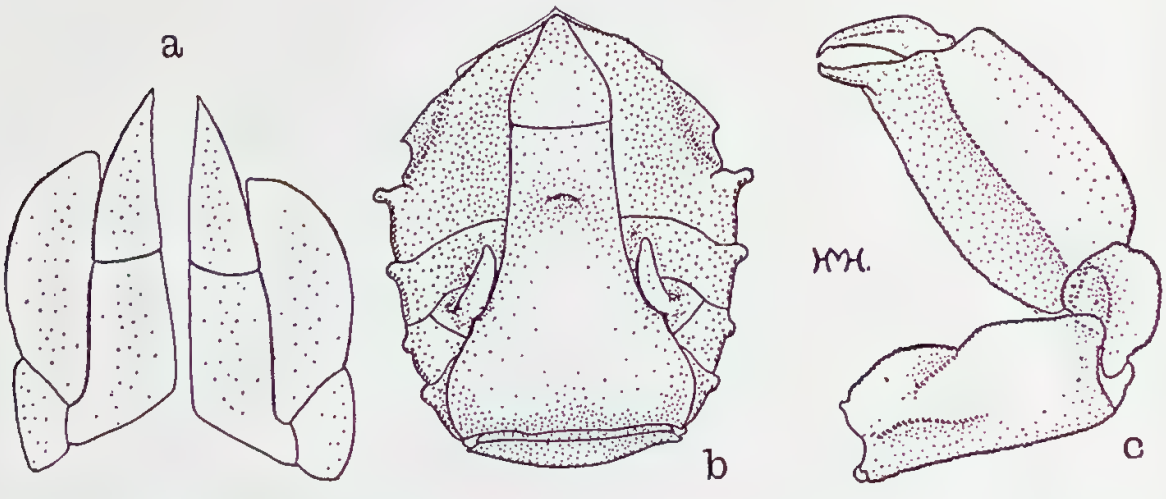

Fig. 24. *Cryptocnemus haddoni*, male; *a*, outer maxillipeds (× 22); *b*, sternum and abdomen (× 14); *c*, dorsal view of right cheliped (× 14).

This species was known previously from the female only. A male collected by the late A. R. McCulloch differs from Calman's description and figure in the following particulars: The carapace is less convex fore and aft, and has the postero-lateral angles rather more distinct. The hinder margin is upturned, convex when viewed from behind, with the minutely beaded edge not concave in dorsal view. The median dorsal carina is faintly granulate in parts, slightly elevated on the mesogastric region (the elevation shallowly divided by a small incision) and also on the cardiac region; the mesogastric protuberance is rounded and the cardiac elevation obtusely angular, in lateral view. The chelipeds have the margins of the segments finely beaded and acute. There is a milled ridge on the posterior third of both upper and lower (interior and exterior) surfaces of the arm, and the hinder half of the inner face bears a sharp crest; the inner upper edge is broken, and runs on to the dorsal surface. The trigonous wrist and the palm each have a ridge on both upper and lower surfaces, the upper

ridges more marked than those of the under-surface. The palm is one and one-third times as long as broad, and the dactylus is half as long as the palm.

Fig 25. *Cryptocnemus haddoni*, male (× 4½).

Fig. 26. *Nursia abbreviata*, immature female (× 4½).

The abdomen has a short curved ridge, partly encircling a depression, at about the third fourth of the length of the long segment. This segment rests between two queer little processes of the sternum, as shown in fig. 24 b.

Length of carapace, 5 mm.; width of carapace, 6·25 mm.

Loc. Queensland: Cairns Reef (A. R. McCulloch, 1913).

Hab. Queensland.

Owing to the elevation of the hind edge of the carapace, this margin appears somewhat concave in the photograph (fig. 25), but in reality it is very slightly convex.

NURSIA Leach, 1817.

NURSIA ABBREVIATA Bell.

Nursia abbreviata Bell, Trans. Linn. Soc., xxi, 1855, p. 308, pl. xxxiv, fig. 5; Miers, Zool. Alert, 1884, p. 253; Henderson, Trans. Linn. Soc., (2) v, 1893, p. 404; Alcock, Journ. Asiat. Soc. Bengal, lxv, 1896, p. 185; Ihle, Res. expl. Siboga, xxxix b2, 1918, p. 235.

A single specimen, taken by Mr. E. H. Rainford, confirms Miers' record of the species from Queensland. The example now examined is an immature female, which differs from Bell's description and figures in having the carapace slightly wider in relation to its length and in having the hinder margin almost evenly convex, not with a median, shallow, very slightly emarginate lobe, as figured by Bell and described by Alcock. Also, the oblique milled ridges which meet the anterior median ridge do not reach to the lateral margins of the carapace; the elevation on the cardiac region is not granulate. The front is rather prominent, with the margin a little sinuate.

Length of carapace, 5·5 mm.; width of carapace, 6·5 mm.

Loc. Queensland: Bowen Harbour, Port Denison (E. H. Rainford, 1925).

Hab. India and Queensland.

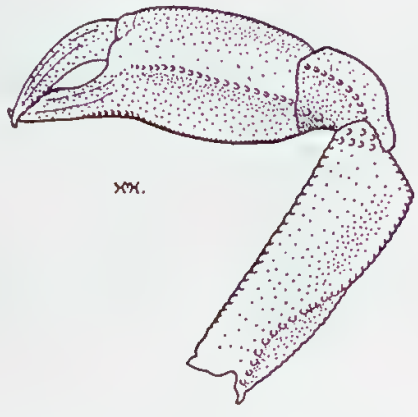

Fig. 27. Dorsal view of right cheliped of *Nursia abbreviata*, immature female (× 14).

Ihle (*ut supra*, pp. 311, 312) appears to have missed the Australian record for this form when listing the distribution of the species of *Nursia*. Also, *N. ypsilon* Ortmann (3), catalogued in the Zoological Record as from Thursday Island, has not been included by Ihle; the description of *N. ypsilon* is not available to me.

The specimen noted above was taken from the stomach of a whiting; it has been remarked that European species of the family are often found in the stomachs of marine fishes.

(3) Ortmann, Denk. Ges. Jena, viii, 1895, p. 36, pl. ii, fig. 7.

Further RECORDS of AUSTRALIAN OPOSSUM SHRIMPS *(MYSIDACEA)*

By W. M. TATTERSALL, D.Sc., Professor of Zoology,
University College, Cardiff.

Text figs. 28-30.

Since the publication of my paper on Australian Mysidacea (1) I have received a further small collection of specimens from the South Australian Museum. These include, firstly, two species of *Siriella*, collected by Mr. H. M. Hale in North Queensland, which I doubtfully refer to species described by Hansen from the waters of the Dutch East Indies. They represent additions to the Mysidacean fauna of Australia. Secondly, there is included a tube of Mysids collected by the late Dr. W. E. J. Paradice in Watson's Bay, Sydney Harbour, containing several specimens of an exceedingly interesting new species, for which a new genus is proposed. This species possesses features quite unknown in any other Mysid, particularly in the form of the pleopods of the male. I am greatly indebted to Mr. Hale for this interesting material. The known Mysidacea of Australian waters now includes fourteen species. I have to thank my wife for the drawings which illustrate this report.

Family MYSIDAE.

Subfamily Siriellinae.

Siriella Dana.

Siriella vulgaris Hansen (?).

Loc. Dredged in Owen Channel, Flinders Island, Princess Charlotte Bay, North Queensland, January, 1927 (C. 1683, coll. H. M. Hale).

Two immature females, 4–5 mm. in length, were taken. They are not in good condition, and I can find no important differences between them and the description and figures of *S. vulgaris* as given by Hansen in the Siboga Report. In the absence of male specimens, I record them provisionally under this name.

(1) Tattersall, Rec. S. Aust. Mus., iii, 1927, pp. 235-257.

SIRIELLA INORNATA Hansen (?).

Loc. Dredged in Owen Channel, Flinders Island, Princess Charlotte Bay, North Queensland, January, 1927 (C. 1691, coll. H. M. Hale).

Two males, 7–9 mm. in length, were secured; one is immature, but the other appears to be completely adult. They agree very closely with *S. inornata,* as described and figured by Hansen, except for a small difference in the terminal part of the exopod of the fourth pleopod of the male. The modified seta on

Fig. 28. *Siriella inornata.* Terminal part of the exopod of the fourth pleopod of the male (× 110).

the penultimate joint is on the side opposite to that on which it is placed in *S. inornata* according to Hansen, and it is somewhat longer and stouter. The shorter of the two setae on the terminal joint is also relatively longer than shown in Hansen's figure. I give a figure (fig. 28) of the terminal part of the exopod of the fourth pleopod of the male for comparison with Hansen's figure (2). My material is too scanty to make sure whether this difference is constant, and I prefer, for the present, to record the specimens under Hansen's name.

Subfamily Mysinae.

Tribe ERYTHROPINI.

AUSTRALERYTHROPS gen. nov.

Eyes large, not depressed, pigment black. *Antennal scale* with the outer margin not setose, terminating in a prominent spine which projects beyond the apex of the scale; without terminal articulation. *Mandibles* with the incisive part and the movable lacinia well developed, molar process prominent, left mandible with the row of strong setae short, right mandible with a row of two

(2) Hansen, Siboga Report, xxxvii, pl. 4, fig. 2g.

or three toothed spines in the place of the strong setae; second joint of the palp moderately expanded, terminal joint rather long and narrow. *Maxilla* with the terminal joint of the palp not expanded; exopod well developed, equal in length to the first joint of the palp. *Maxillipeds* robust, second joint with a very conspicuous endite. *Gnathopods* somewhat long and slender. *Remaining thoracic limbs* slender, with the sixth joint of the endopod divided by transverse articulations into four subjoints. In the third thoracic limb the first of these subjoints is further divided by an oblique articulation. *Telson* entire, linguiform in shape, distal part of the lateral margins and apex armed with numerous closely set short spines, no plumose setae at the apex. *Inner uropods* with a row of stout spines extending almost the whole length of the inner margin. *Pleopods* of the male: First pair rudimentary as in the female, consisting of a simple, short, unjointed plate armed with setae; second and third pairs biramous, the rami subequal in length; fourth and fifth pairs biramous, with the endopod considerably longer than the exopod, and with some of the terminal setae modified; the endopod of the fifth pair more elongate than that of the fourth pair. *Incubatory lamellae* in the female, three pairs, the first pair small.

The most distinctive feature of this new genus is the structure of the pleopods in the male. The nearest approach to the condition in *Australerythrops* is to be found in the genus *Holmesiella* Ortmann, but, in that genus, the first pleopod is not rudimentary and the endopod of the fourth pleopod only of the male is elongated and modified. Not only is the endopod of the fifth pleopod of the male in *Australerythrops* elongated and modified, but it is much longer than the endopod of the fourth pair. The form of the pleopods of the male in this genus is unparalleled in any other genus of the Mysidacea. The combination of the characters of the telson, eyes, antennal scale, and inner uropod will serve to distinguish the female from other genera of the tribe Erythropini, to which I refer this genus.

AUSTRALERYTHROPS PARADICEI sp. nov.

Carapace short, leaving the last two thoracic somites free, anterior margin not produced into a rostral plate, evenly rounded, and slightly upturned in lateral view, the whole of the eyes and eyestalks completely uncovered (fig. 29, *a*); anterolateral corners rounded. *Eyes* large, round, not dorsoventrally flattened or depressed, pigment black, eyestalks rather narrow and projecting sharply at right angles to the long axis of the body. *Antennular peduncle* (fig. 29, *b*), moderately robust, with a well-developed setose lobe in the male. *Antennal scale* (fig. 29, *c*) projecting slightly in front of the antennular peduncle four times as long as broad at its widest part, without terminal articulation, outer margin entire and without setae, and terminating in a strong spine which projects beyond the apex of the scale; antennal peduncle only about half

the length of the scale, the three joints subequal in length; no spine at the outer distal corner of the joint from which the scale arises. *Sixth abdominal somite* equal in length to the fourth and fifth combined. *Telson* (fig. 30, *e*) shorter

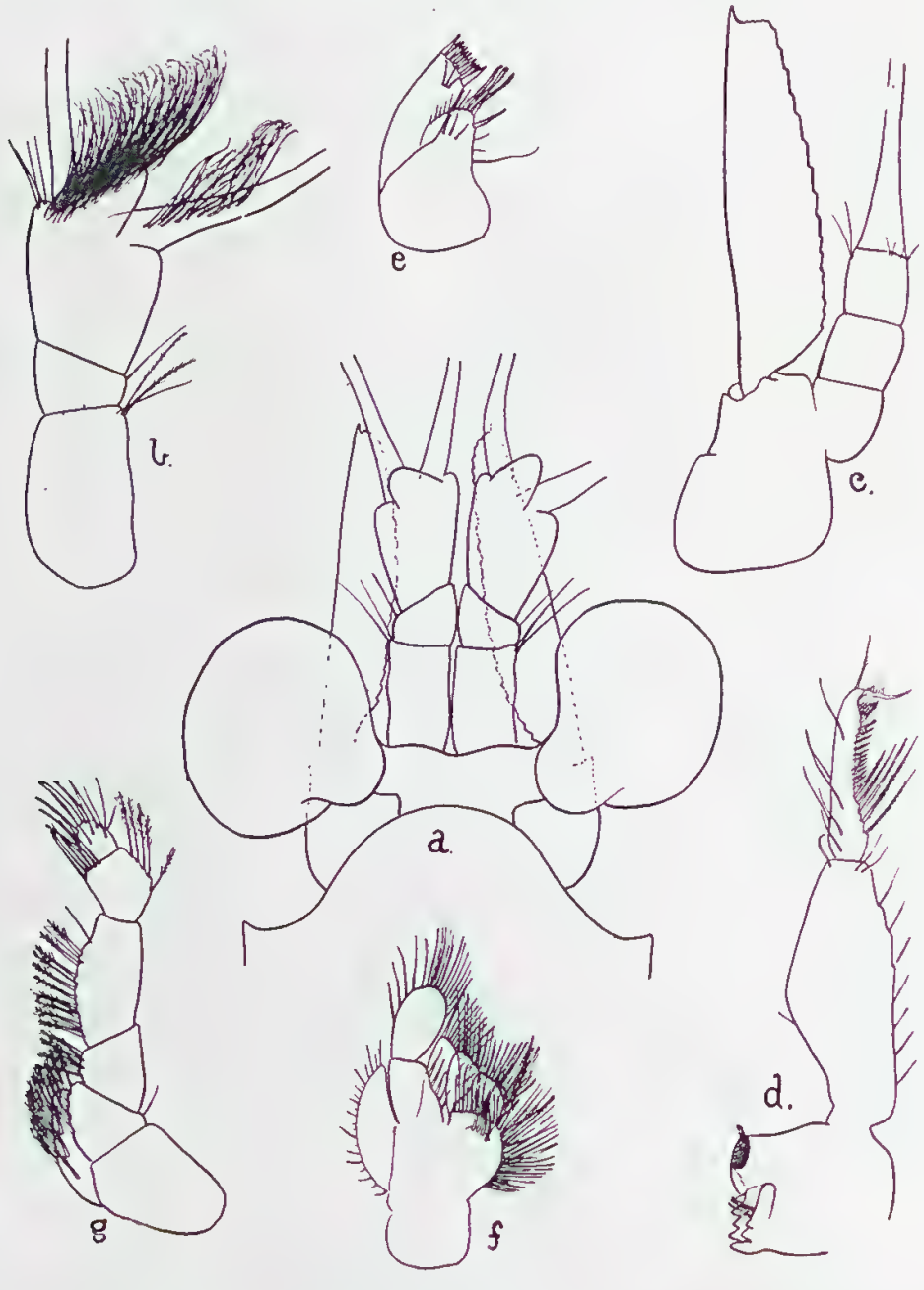

Fig. 29. *Australerythrops paradicci*. *a*, Dorsal view of the anterior end of a young male (× 39); *b*, antennular peduncle of an adult male (× 39); *c*, antennal scale and peduncle (× 39); *d*, mandible and palp (× 50); *e*, maxillula (× 50); *f*, maxilla (× 50); *g*, endopod of the maxilliped (first thoracic limb) (× 50).

than the sixth abdominal somite, two and a quarter times as long as broad at the base, linguiform in shape, entire, without cleft, narrowing slightly to a broad and evenly rounded apex. The distal half of the margins of the telson are armed with about thirty to thirty-five short, closely set spines, those on the rounded apex rather shorter and more evenly and regularly arranged than the

lateral ones. There are no apical plumose setae. *Inner uropod* (fig. 30, *f*) one and a quarter times as long as the telson, inner margin with a row of about twenty-three short spines extending from the statocyst very nearly to the apex.

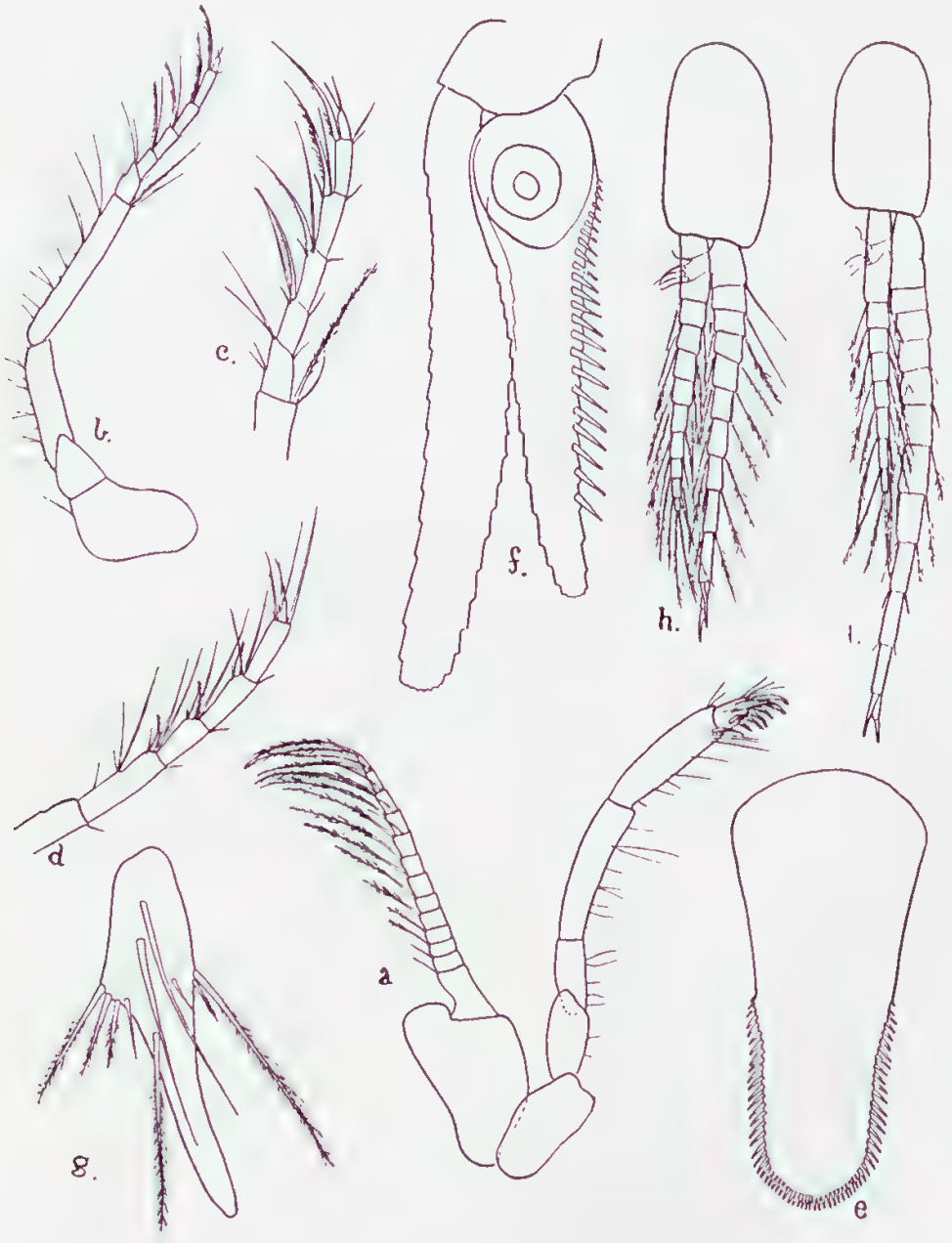

Fig. 30. *Australerythrops paradicci*. *a*, Gnathopod (second thoracic limb) (× 32); *b*, endopod of the third thoracic limb (× 32); *c*, sixth and seventh joints of the endopod of the third thoracic limb (× 50); *d*, sixth and seventh joints of the endopod of the eighth thoracic limb (× 50); *e*, telson (× 50); *f*, uropods (× 50); *g*, first pleopod of the male (× 125); *h*, fourth pleopod of the male (× 39); *i*, fifth pleopod of the male (× 39).

Outer uropod one and a half times as long as the telson. *Pleopods of the male:* First pair rudimentary, each consisting of a very small, single, unjointed plate armed with a few long setae (fig. 30, *g*). Second and third pairs biramous, the rami equal in length and without modified setae. Fourth pair (fig. 30, *h*) with

the endopod longer than the exopod, the last two joints each armed with a single, stout, non-plumose seta. Fifth pair (fig. 30, *i*) with the endopod considerably longer than the exopod, nearly one and three-quarter times as long, the last two joints each armed with a single stout, simple seta, the preceding three joints with the normal plumose setae considerably reduced in length. *Brood pouch of the female* formed by three pairs of lamellae attached to the last three thoracic limbs, the first pair very small but distinctly present. *The mouth parts and thoracic limbs* are best described by reference to the figures. The mouth parts are essentially of the type characteristic of the Erythropini. The mandibles (fig. 29, *d*), have the incisive part, the lacinia, and the molar processes well developed. The maxillae (fig. 29, *f*) have a well-developed exopod, a setiform lobe on the second joint, and the terminal joint of the palp not expanded. The maxillipeds (first thoracic limbs) (fig. 29, *g*) are moderately robust, with a prominent endite on the second joint. The gnathopods (second thoracic limbs) (fig. 30, *a*) are rather long and comparatively slender, the fourth and fifth joints subequal in length, the sixth short and armed with a number of strong, short, plumose spines, and there is a well-developed nail. The remaining thoracic limbs (fig. 30, *b*) are somewhat slender. The sixth joint of the endopod of the fourth to the eighth pair (fig. 30, *d*) is divided into four subjoints by transverse articulations, and at the inner distal corner of each subjoint there is a stout plumose spine, shorter than the subjoint. In the endopod of the third pair of thoracic limbs (fig. 30, *c*) the sixth joint is divided into five subjoints, the first articulation being somewhat oblique and bearing no plumose spine, and the stout plumose spine on the inner distal corners of the subjoints is much longer than the subjoint.

Length, of adult males and females, 7 mm.

Loc. Watson's Bay, Port Jackson, New South Wales. "From dark crevice in eddy among the rocks at low water on the shore"; about fifty specimens of both sexes (W. E. J. Paradice).

I know of no other species of Mysid with which this interesting new form can be confused. The structure of the pleopods of the male is unique. It comes nearest to *Holmesiella anomala* Ortmann, but in that species the first pleopod of the male is not rudimentary, only the fourth pleopod has an elongate and modified endopod, and the telson has a somewhat different shape and armature. *Holmesiella anomala* is, moreover, a large species, the type measuring 37 mm. I have pleasure in associating this interesting addition to the Mysidacean fauna of Australia with the name of the late Dr. W. E. J. Paradice, who collected the material upon which this description is based.

In the preparation from which the drawing reproduced in fig. 29, *d* was made, the body of the mandible has become somewhat displaced, with the result that the spine-row is overlaid by the incisive part.

BRYOZOA FROM SOUTH AUSTRALIA

By ARTHUR A. LIVINGSTONE, Australian Museum.

(With the permission of the Trustees of the Australian Museum, Sydney.)

Text figs. 31-35.

By the courtesy of the authorities of the South Australian Museum I have been able to examine, and compile the following notes upon, a small portion of the extensive bulk collections of Bryozoa under their care. Most of the dredgings were secured by Sir Joseph Verco, Honorary Conchologist to the above institution, to whom many scientific workers are indebted for the extensive collections of marine animals that he has dredged in the seas of southern Australia.

The work so far accomplished on recent South Australian forms is meagre when compared with that concerning species of other States. The first worker to recognize this was MacGillivray, to whom credit is due for the initial investigation of the South Australian species; Hutton and Maplestone were also responsible for the record of several forms, while other isolated records by various authors have assisted our knowledge.

In regard to the present collection, nothing of outstanding importance can be claimed, apart from the discovery of two new species, and the rediscovery of *Parmularia macneilli*, which was described in the first part of my "Studies on Australian Bryozoa" (1).

All the material examined was dredged and, as is often the case with such collections, it is not in the best condition for study. Nevertheless, most of the species can be recognized with little difficulty, and there are extremely few beyond the possibility of generic identification.

As the literature on the South Australian species is small and so easily assembled, a revision has been considered unnecessary. The contributions on recent marine South Australian Bryozoa to be consulted are:

Hutton, Proc. Roy. Soc. Tasmania, 1876 (1877), pp. 23-25.

MacGillivray, Trans. Proc. Roy. Soc. S. Austr., xii, 1889, pp. 24-30.

MacGillivray, Trans. Proc. Roy. Soc. S. Austr., xiii, 1890, pp. 1-7.

Maplestone, Proc. Roy. Soc. Victoria, xvi (n.s.) ii, 1903 (1904), pp. 207-217.

Maplestone, Proc. Roy. Soc. Victoria, (n.s.) xxiii, i, 1910, pp. 39-41.

(1) Livingstone, Rec. Aust. Mus., xiv, 3, 1924, p. 194.

Maplestone, Proc. Roy. Soc. Victoria, (n.s.) xxiii, i, 1910, pp. 42-43.

Bale, Proc. Roy. Soc. Victoria, (n.s.) xxxv, i, 1922, p. 109.

Harmer, "Siboga" Exped., Polyzoa ii, Monogr. xxviiib, 1926, pp. 182-501 (this work contains records of specimens from S. Austr. which are in British Museums).

Following is a list of the species in the present collection; those marked with an asterisk are new records for the State of South Australia.

Caleschara denticulata (MacGill.).
Capidozoum falcata (MacGill.).
**Hiantopora radicifera* (Hincks).
Hiantopora ferox (MacGill.).
Steganoporella magnilabris (Busk).
Thairopora dispar (MacGill.).
**Thairopora mamillaris* (MacGill.).
**Selenaria punctata* Ten.-Woods.
Lunularia capulus (Busk).
Cellaria rigida MacGill.
Cellaria australis MacGill.
**Cellaria fistulosa* (Linn.).
**Cellaria angustiloba* (Busk).
Arachnopusia monoceros (Busk).
Scuticella ventricosa (Busk).
Adeona grisea Lamouroux.
Adeonellopsis foliacea MacGill.
Retepora phoenicea Busk.
Retepora monilifera MacGill. var. *munita* Hincks.
Tubucellaria hirsuta (Lam.).
**Schizoporella vercoi* sp. nov.
Schizoporella acuminata Hincks (fossil record only).
Parmularia obliqua (MacGill.).
**Parmularia macneilli* Livingstone.
**Emballotheca quadrata* (MacGill.).
Peristomella excavata (MacGill.).
Didymosella larvalis (MacGill.).
**Haswellina coronata* (Reuss).
Gephyrophora biturrita (Hincks).
Microporella ciliata (Linn.).
Calloporina diadema (MacGill.).
**Conescharellina angulopora* (Ten.-Woods).
**Bipora umbonata* (Hasw.).
**Smittina nitida* (Verrill).
**Smittina reticulata* (MacGill.).
**Sphaeropora fossa* (Hasw.).
Petralia undata MacGill.
Petralia vultur (Hincks).
**Petralia halei* sp. nov.
**Amathia spiralis* Lamx.

CALESCHARA DENTICULATA (MacGillivray).

Fig. 31.

Eschara denticulata MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, 1868 (1869), p. 138.

Caleschara denticulata MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. v, 1880, p. 45, pl. xlviii, fig. 8.

This species is not uncommon in eastern and southern waters of the Australian continent.

Loc. South Australia: Investigator Strait, 20 fathoms; Beachport, 40 fathoms, 26.12.1905; 7 miles S.W. of Newland Head, Encounter Bay, 20 fathoms.

22.11.1906; 3 miles S. of Tunk Heads, 16 fathoms; off Ardrossan, Gulf St. Vincent, 14 fathoms.

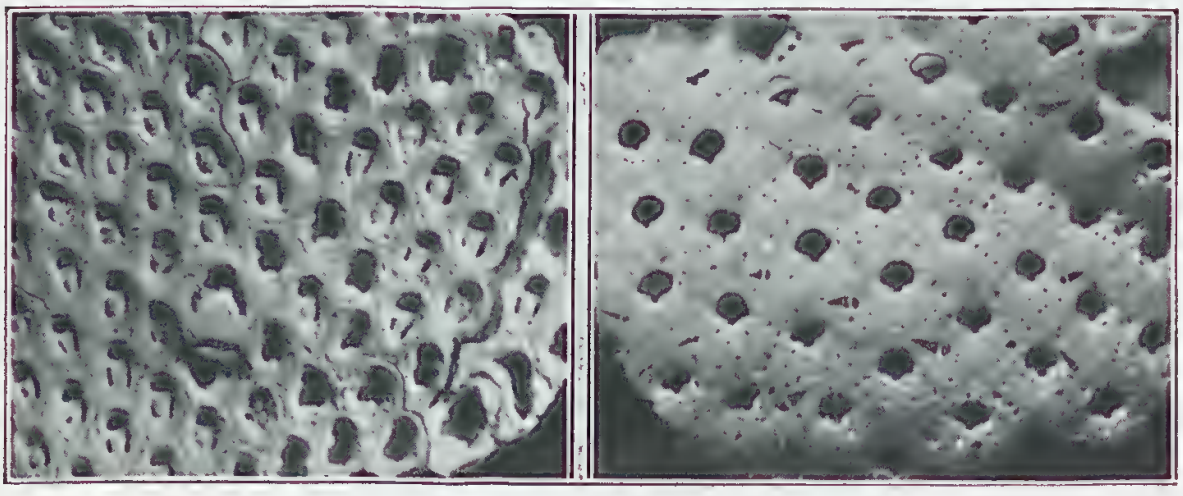

Fig. 31. *Calescharа denticulata.* Zooecial detail of an old and heavily calcified colony. *Photo, G. C. Clutton.*

Fig. 32. *Schizoporella vercoi.* Zooecial detail. *Photo, G. C. Clutton.*

CAPIDOZOUM FALCATA (MacGillivray).

Membranipora falcata MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, 1869, p. 132.

Membranipora perminuta Hincks, Ann. Mag. Nat. Hist. (5) vii, 1881, p. 151.

Amphiblestrum perminutum MacGillivray *in* McCoy, Prodr. Zool. Viet., dec. xi, 1885, p. 22, pl. 106, fig. 3.

Capidozoum falcata Harmer, "Siboga" Exped., Polyzoa ii, Monogr. xxviiib, 1926, p. 227.

This species is represented in the collection by a single fragment which is devoid of ooecia.

Loc. South Australia: 3 miles S. of Tunk Heads, 16 fathoms.

HIANTOPORA RADICIFERA (Hincks).

Membranipora radicifera Hincks, Ann. Mag. Nat. Hist. (5) viii, 1881, p. 3, pl. ii, figs. 6, 6a, 6b.

Hiantopora radicifera Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 111, pl. iv, figs. 6a-6c.

Tremopora radicifera Canu and Bassler, U.S. Nat. Mus., Bull. 106, 1920, p. 139.

Hiantopora radicifera Harmer, "Siboga" Exped., Polyzoa ii, Monogr. xxviiib, 1926, p. 236, pl. 34, fig. 4.

Loc. South Australia: 3 miles S. of Tunk Heads, 16 fathoms.

HIANTOPORA FEROX (MacGillivray).

Lepralia ferox MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, 1868 (1869), p. 132.

Hiantopora ferox Harmer, "Siboga" Exped., Polyzoa ii, Monogr. xxviiib, 1926, p. 236.

Loc. South Australia: 12 miles S.E. by S. of Newland Head, Encounter Bay, 24 fathoms.

STEGANOPORELLA MAGNILABRIS (Busk).

Membranipora magnilabris Busk, Brit. Mus. Catal. Marine Polyzoa, i, 1852, p. 62, pl, lxv, fig. 4.

Steganoporella magnilabris Harmer, Quart. Journ. Micr. Sci., 43, ii (n.s.), 1900, p. 279, figs. 10, 31, 44, 45, 46.

Loc. South Australia: Beachport, 40 fathoms; 7 miles S.W. of Newland Head, Encounter Bay, 20 fathoms, 22.11.1906; 3 miles S. of Tunk Heads, 16 fathoms; off Port Wallaroo, 15 fathoms, January, 1905.

THAIROPORA DISPAR (MacGillivray).

Membranipora dispar MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, 1868 (1869), p. 131.

Thairopora dispar Harmer, "Siboga" Exped., Polyzoa ii, Monogr. xxviiib, 1926, p. 288.

Loc. South Australia: Off Port Morowie, 14 fathoms.

THAIROPORA MAMILLARIS (MacGillivray) (Lamouroux ?).

Membranipora mamillaris MacGillivray, Trans. Phil. Inst. Victoria, iv, 1860, p. 165, pl. ii, fig. 3.

Thairopora mamillaris Harmer, "Siboga" Exped., Polyzoa ii, Monogr. xxviiib, 1926, p. 289.

Loc. South Australia: Port Willunga, 14 fathoms.

SELENARIA PUNCTATA Tenison-Woods.

Selenaria punctata Tenison-Woods, Trans. Roy. Soc. South Austr., iii, 1880, p. 9, pl. ii, figs. 8a-8c.

Selenaria punctata Waters, Journ. Linn. Soc. Zool., xxxiv, 1921, p. 416, pl. xxix, fig. 7.

Loc. South Australia: Off Ardrossan, Gulf St. Vincent, 6-8 fathoms; Investigator Strait, 20 fathoms.

LUNULARIA CAPULUS (Busk).

Lunulites capulus Busk, Brit. Mus. Catal. Mar. Polyzoa, ii, 1854, p. 100, pl. cxii.

Lunularia capulus Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 198.

The synonymy of the above species has already been dealt with by me in a previous paper *(loc. cit)*. *Selenaria livingstonei* Bretnall and *Lunulites patelliformis* Maplestone have been found to be synonyms.

It is worthy of note that the specimens before me were, like "*L. patelliformis,*" secured by Sir Joseph Verco from Investigator Strait, and the examination of this duplicate material confirms my opinion as to the status of this latter species.

Loc. South Australia: Investigator Strait, 20 fathoms.

CELLARIA RIGIDA MacGillivray.

Cellaria rigida MacGillivray, Trans. Proc. Roy. Soc. Victoria, xxi, 1884, p. 92, pl. i, figs. 1-2.

Cellaria rigida MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. xi, 1885, p. 17, pl. 105, fig. 1.

Cellaria rigida Jelly, Syn. Cat. Rec. Marine Bryozoa, 1889, p. 44.

The specimens before me are attached to "*Dictyopora grisea*" *(Adeona grisea)*, therein agreeing with MacGillivray's remarks regarding anchorage.

Loc. South Australia: 12 miles S.S. by S. from Newland Head, Encounter Bay, 24 fathoms.

CELLARIA AUSTRALIS MacGillivray.

Cellaria fistulosa var. *australis* MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. v, 1880, p. 48.

Cellaria fistulosa var. *australis* Hincks, Ann. Mag. Nat. Hist. (5) xiii, 1884, p. 368.

Cellaria australis MacGillivray, Trans. Proc. Roy. Soc. Victoria, xxi, 1884, p. 93.

Loc. South Australia: Off Port Morowie, 14 fathoms.

CELLARIA FISTULOSA (Linnaeus).

Eschara fistulosa Linnaeus, Syst., ed. 10, (1758) 108 (*fide* Hincks, Brit. Marine Polyzoa, i, 1880, p. 106, pl. xiii, figs. 1-4.

Cellaria fistulosa Jelly, Syn. Cat. Rec. Marine Bryozoa, 1889, p. 42.

Loc. South Australia: Off Ardrossan, Gulf St. Vincent, 6-8 fathoms.

CELLARIA ANGUSTILOBA (Busk).

Melicerita angustiloba Busk, Quart. Journ. Geol. Soc., xvi, 1860, p. 261.

Cellaria angustiloba Waters, Quart. Journ. Geol. Soc., xxxviii, 1882, p. 260, pl. ix, figs. 28-30.

Cellaria angustiloba MacGillivray, Trans. Proc. Roy. Soc. Victoria, iv, 1895, p. 27, pl. iii, fig. 16.

The single specimen in the collection does not possess avicularia. It is

slightly worn, though complete enough to show agreement in most details with existing descriptions. A comparison with Tertiary material from deposits at Schnapper Point and Muddy Creek, Victoria, has assisted considerably in substantiating the identification.

Loc. South Australia: Off Cape Jaffa, 300 fathoms.

ARACHNOPUSIA MONOCEROS (Busk).

Lepralia monoceros Busk, Brit. Mus. Catal. Marine Polyzoa, ii, 1854, p. 72.
Arachnopusia monoceros Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 203.

Loc. South Australia: Investigator Strait, 20 fathoms; 3 miles S. of Tunk Heads, 16 fathoms; 12 miles S.E. by S. of Newland Head, Encounter Bay, 24 fathoms.

SCUTICELLA VENTRICOSA (Busk).

Catenicella ventricosa Busk, Voy. "Rattlesnake," 1, 1852, p. 357, pl. 1, fig. 1.
Catenicella ventricosa Busk, Brit. Mus. Cat. Marine Polyzoa, 1, 1852, p. 7, pl. ii, figs. 1-2, pl. iii, figs. 1-5.
Scuticella ventricosa Levinsen. Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 227, pl. xx, figs. 5a-5c; pl. xi, figs. 6a, 6b.

Loc. South Australia: 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms; 7 miles S.W. from Newland Head, 20 fathoms.

ADEONA GRISEA Lamouroux.

Adeona grisea Lamouroux, Expos. Methodique des genres de Polypiers, 1821, p. 40, pl. lxx, fig. 5.
Dictyopora grisea MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. vii, 1882, p. 23, pl. 66, fig. 1.

Loc. South Australia: 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms; Investigator Strait, 20 fathoms; 3 miles S. of Tunk Heads, 16 fathoms; 7 miles S.W. of Newland Head, 20 fathoms, 22.11.1906.

ADEONELLOPSIS FOLIACEA MacGillivray.

Adeonellopsis foliacea MacGillivray, Trans. Proc. Roy. Soc. Victoria, xxii, 1885 (1886), p. 134, pl. ii, fig. 1.
Adeonellopsis foliacea Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 287, pl. xiv, figs. 5 a-d.

Many specimens of this common Australian species have been sorted from the collection. In addition there are many worn fragments which approach *A. australis* MacGillivray (2), but their identity is extremely uncertain, in view of the fact that many of the characters are obliterated through wear.

(2) Trans. Proc. Roy. Soc. Victoria, xxii, 1885 (1886), p. 135, pl. ii, figs. 2-3.

Moreover, the constant variation of the species allied to *A. foliacea,* makes identification very difficult, and it will not be until a complete revision of the species is made that the genus and its representatives will be fully understood.

Loc. South Australia: 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms; off Ardrossan, Gulf St. Vincent, 6-8 fathoms.

RETEPORA PHOENICEA Busk.

Retepora phoenicea Busk, Brit. Mus. Cat. Marine Polyzoa, ii, 1854, p. 94, pl. cxxi, figs. 1-2.

Retepora phoenicea MacGillivray, *in* McCoy, Prodr. Zool. Victoria, dec. x, 1885, p. 27, pl. 98, figs. 1-5.

Loc. South Australia: About 15 miles off Port Wallaroo, January, 1905; Investigator Strait, 20 fathoms; 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms; 12 miles S.E. by S. from Newland Head, 24 fathoms; off Ardrossan, Gulf St. Vincent, 14 fathoms.

RETEPORA MONILIFERA MacGillivray var. MUNITA Hincks.

Retepora monilifera var. *munita* Hincks, Ann. Mag. Nat. Hist. (5) i, 1878, p. 361.

Retepora monilifera from *munita* MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. x, 1885, p. 22, pl. 96, figs. 4-8.

Retepora monilifera var. *munita* Marcus, Kungl. Svenska Vetenskapsakad. Handl., 61, v, 1921, p. 16, pl. 1, figs. 6, 7.

Loc. South Australia: 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms.

TUBUCELLARIA HIRSUTA (Lamouroux).

Cellaria hirsuta Lamouroux, Hist. des. Polyp., 1816, p. 126, pl. ii, fig. 4.

Tubucellaria hirsuta Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 306, pl. xvi, figs. 3a-3c.

Loc. South Australia: 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms.

SCHIZOPORELLA VERCOI (3) sp. nov.

Figs. 32, 33.

Descr. Zoarium encrusting. Zooecia very slightly ovate and undefined, though their boundaries can be approximately distinguished by the relative positions of the zooecial apertures. Frontal walls punctured and deeply pitted, especially near the boundaries of the zooecia.

Distal half of the zooecial aperture semicircular; lateral borders of proximal

(3) Named for Sir J. Verco.

half converging downwards into a median sinus. Near the sinus the borders of the proximal half are clearly serrated, and at the point of junction of each with the sinus there is a very large and sharply pointed denticle. The proximal border and a portion of each lateral border of the aperture is divided into two

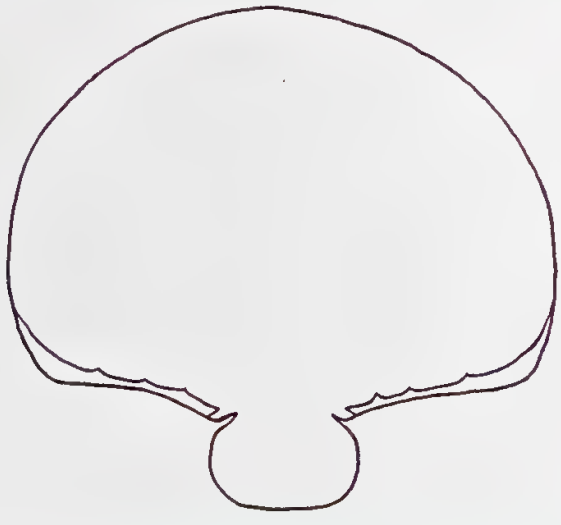

Fig. 33. *Schizoporella vercoi.* Outline of zooecial aperture, showing secondary toothed rim on the inside.

distinct shelves, one placed above the other. The top shelf carries the sinus, and is continuous, but the lower shelf, which carries the serrated edge, is interrupted at the sinus on either side. The two halves of the lower shelf, however, project a little beyond the top shelf, and each section can be easily seen from directly above. Sharply pointed triangular avicularia, which vary greatly in size, occur at random on the frontal zooecial walls. Each avicularian cavity is provided with a mandibular pivot or cross-bar, bearing a median ligula, which points backwards.

Loc. South Australia: Beachport, 40 fathoms, 26.12.1905.

SCHIZOPORELLA ACUMINATA Hincks.

Schizoporella acuminata Hincks, Ann. Mag. Nat. Hist. (5) viii, 1881, p. 14, pl. ii, fig. 1.

Schizoporella acuminata Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 200.

Schizoporella cecilii Maplestone (part), Rec. Austr. Museum, vii, 4, 1909, p. 268.

Loc. South Australia: Cape Jaffa, 300 fathoms.

PARMULARIA OBLIQUA (MacGillivray).

Eschara obliqua MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, 2, 1868, p. 137.

Parmularia obliqua Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 190, pl. xxiii, figs. 1-2; pl. xxv, fig. 1; pl. xxvi, and text fig. 1.

This extremely abundant deep-water species is well represented in the present collection; its peculiar characters have been dealt with by me in a previous paper *(loc. cit.)*. To avoid misunderstanding it may be well to mention here that Canu and Bassler (4) have credited the genus to Maplestone instead of to MacGillivray.

Loc. South Australia: Off Port Morowie, 14 fathoms; off Ardrossan, Gulf St. Vincent, 6-8 fathoms; about 15 miles off Port Wallaroo, January, 1905; 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms; 12 miles S.E. by S. from Newland Head, 24 fathoms; Investigator Strait, 20 fathoms; Beachport, 40 fathoms; 3 miles S. of Tunk Heads, 16 fathoms.

PARMULARIA MACNEILLI Livingstone.

Parmularia macneilli Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 194, pl. xxiv, figs. 1-2; pl. xxv, fig. 2.

As stated in the original description, this species is very rare, and is found among material dredged from deep water.

The hollow proximal border of the zooecial aperture, together with the conspicuous hinge teeth, serve as good characters upon which the species can be separated from its allies. Its occurrence in South Australian waters extends its range westwards from the localities cited in the above paper.

The single specimen before me does not exhibit any variation when compared with the type specimen.

Loc. South Australia: Off Port Morowie, 14 fathoms.

EMBALLOTHECA QUADRATA (MacGillivray).

Lepralia quadrata MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. v, 1880, p. 42, pl. 48, fig. 5.

Emballotheca quadrata Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 334, pl. xviii, figs. 13a-13e.

Although somewhat like *Parmularia obliqua* (MacGillivray), this well-marked species can be easily separated by the arrangement and shape of the zooecia. It is not so abundant as *P. obliqua,* and is represented in the collection by only two fragments.

Loc. South Australia: Beachport, 40 fathoms; 7 miles S.W. of Newland Head, Encounter Bay, 22.11.1906.

(4) Canu and Bassler, Proc. U.S. Nat. Museum, 69, Art. 14, 1927, pp. 21 and 35.

PERISTOMELLA EXCAVATA (MacGillivray).

Mucronella excavata MacGillivray, Trans. Phil. Inst. Victoria, 1859, iv, p. 166, pl. ii, fig. 4.

Mucronella excavata MacGillivray, Trans. Roy. Soc. S. Austr., xiii, 1890, p. 5.

Escharoides praestans Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 318, pl. xvii, figs. 4 a-b.

Escharoides excavata Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 197.

In a previous paper *(loc. cit.)* I have given notes on the synonymy of this species, and after examining two specimens in the present collection see no reason to depart from the conclusions set out therein, except in regard to the generic position. I have followed Canü and Bassler in this connection, as shown in my Supplementary Report upon the Mawson Antarctic Bryozoa. (5).

Loc. South Australia: Beachport, 40 fathoms, 26.12.1905.

DIDYMOSELLA LARVALIS (MacGillivray).

Lepralia larvalis MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, 1868 (1869), p. 134.

Escharoides larvalis Livingstone, Rec. Austr. Museum, xv, 2, 1926, p. 170, pl. xi.

Didymosella larvalis Canu and Bassler, U.S. Nat. Museum, Bull. 106, 1920, p. 416.

Loc. South Australia: Off Port Morowie, 14 fathoms.

HASWELLINA CORONATA (Reuss).

Cellaria coronata Reuss, Fossile Polyparien d. Wiener Tertiär Beckens, Haidinger Naturwiss. Abhandl., II, 1848, p. 62, T. viii, fig. 3 (*fide* Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 299).

This species is not uncommon off the coasts of New South Wales, Victoria, and Tasmania, where it is invariably met with in material taken from deep water. The name *Haswellia* is preoccupied and has been altered in a previous paper (6).

Loc. South Australia: Off Ardrossan, Gulf St. Vincent, 6-8 fathoms; off Port Wallaroo, about 15 fathoms, January, 1905; Beachport, 40 fathoms, 26.12.1905; 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms; off Cape Jaffa, 300 fathoms.

GEPHYROPHORA BITURRITA (Hincks).

Schizoporella biturrita Hincks, Ann. Mag. Nat. Hist. (5) xiv, 1884, p. 280.

Gephyrophora biturrita Canu and Bassler, U.S. Nat. Museum, Bull. 106, 1920, p. 521.

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(5) Livingstone, Austr. Antarctic Exped. Repts., ser. C, viii, pt. iv, 1928, p. 61.

(6) Livingstone, Austr. Antarctic Exped. Repts., ser. C, viii, pt. iv, p. 71.

Loc. South Australia: 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms, 11.2.1906; 12 miles S.E. by S. from Newland Head, 24 fathoms; off Port Morowie, 14 fathoms.

MICROPORELLA CILIATA (Linnaeus).

Cellepora ciliata Linnaeus, Systema Naturae, ed. xii, 1759, p. 1286.

Microporella ciliata, Canu and Bassler, U.S. Nat. Museum, Bull. 125, 1923, p. 119, pl. xx, figs. 1-6; pl. xxxvi, figs. 4-5.

Loc. South Australia: Investigator Strait, 20 fathoms.

CALLOPORINA DIADEMA (MacGillivray).

Microporella diadema MacGillivray, Trans. Proc. Roy. Soc. Victoria, iv, 1895, p. 65.

Calloporina diadema Canu and Bassler, U.S. Nat. Mus., Bull. 125, 1923, p. 128.

The introduction of this species into the genus *Calloporina* Neviani appears to be advantageous, and assists considerably in clearing up the large number of species formerly grouped under *Microporella*. I have found, however, that little, if any, reliance can be placed on the shape of the ascopore, as this character is extremely inconsistent, not only in Australian but also in foreign specimens.

Loc. South Australia: About 15 miles off Port Wallaroo, January, 1905.

CONESCHARELLINA ANGULOPORA (Tenison-Woods).

Lunulites angulopora Tenison-Woods, Trans. Roy. Soc. S. Austr., iii, 1879-1880, p. 7, pl. 1, figs. 3-3a-c.

Conescharellina angulopora Livingstone, Rec. Austr. Museum, xiv, 3, 1924, p. 205.

The problem of synonymy surrounding this species has been dealt with by me in a paper on the representatives of the family *(loc. cit.)*, and since its publication nothing has come before my notice that would cause a deviation from the conclusions set out therein.

The specimens in the present collection are considerably worn, but undoubtedly belong to this species.

Loc. South Australia: 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms, 22.11.1906; off Cape Jaffa, 300 fathoms.

BIPORA UMBONATA (Haswell).

Eschara umbonata Haswell, Proc. Linn. Soc. N.S. Wales, v, 1880, p. 41, pl. ii, figs. 5-6.

Bipora umbonata Livingstone, Rec. Austr. Museum, xiv, 3, 1924, pp. 209 and 211.

Bipora umbonata Livingstone, Rec. Austr. Museum, xv, i, 1926, p. 98, pl. v, figs. 4-5.

This extremely interesting species is represented in the present collection by a single fragment. The species does not assume a regular colonial growth, but may be anything from a flat, bilaminate, unbranched growth to a well-branched colony. It can be readily recognized by its bilaminate growth, nodulated surface, and undefined zooecia.

Loc. South Australia: Investigator Strait, 20 fathoms.

SMITTINA NITIDA (Verrill).

Discopora nitida Verrill, Amer. Journ. Sci., ix, 1875, p. 415, pl. vii, fig. 3.
Smittia nitida Waters, Journ. Linn. Soc. Zool., xxxi, 1909, p. 173, pl. xvii, figs. 19, 20.

Loc. South Australia: 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms, 22.11.1906.

SMITTINA RETICULATA (MacGillivray).

Lepralia reticulata MacGillivray, Ann. Mag. Nat. Hist., ix, 1842, p. 467.
Smittia reticulata Hincks, Hist. Brit. Marine Polyzoa, 1880, p. 346, pl. xlviii, figs. 1-5.

Loc. South Australia: Off Ardrossan, Gulf St. Vincent, 6-8 fathoms.

SPHAEROPORA FOSSA Haswell.

Sphaeropora fossa Haswell, Proc. Linn. Soc. N.S. Wales, v, 1881, p. 42, pl. iii, fig. 5.
Cellepora fossa MacGillivray, Trans. Roy. Soc. Victoria, iv, 1895, p. 108, pl. xiv, figs. 8-10.

Loc. South Australia: Off Cape Jaffa, 300 fathoms.

PETRALIA UNDATA MacGillivray.

Petralia undata MacGillivray, Trans. Proc. Roy. Soc. Victoria, ix, i, 1868, p. 141.
Petralia undata Livingstone, Rec. Austr. Museum, xv, 2, 1926, p. 169, pl. xii, figs. 1-3.

The large number of specimens in the collection before me proves this species to be as abundant in South Australian waters as it is in Victoria and New South Wales. Most of the specimens are worn, and have no doubt suffered removal from their original habitat by the action of currents and associated disturbances.

Loc. South Australia: Off Port Morowie,, 14 fathoms; Investigator Strait, 20 fathoms; 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms; off Ardrossan, Gulf St. Vincent, 14 fathoms; 3 miles S. of Tunk Heads, 16 fathoms.

PETRALIA VULTUR (Hincks).

Fig. 34.

Mucronella vultur Hincks, Ann. Mag. Nat. Hist. (5) x, 1882, p. 98, pl. viii, fig. 2.

Mucronella vultur MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. xii, 1886, p. 65, pl. 116, figs. 5-8.

From past observations, as well as deductions drawn from specimens in the present collection, it has been ascertained that the species is much rarer than the foregoing. It is subjected to considerable structural variation as it proceeds northward from its eastern habitat, as instanced by the number of varieties described from within the tropical zone.

The typical form when young is easily recognizable on account of the clearly cut structural detail, but as the colony grows older it becomes heavily calcified and the characters almost obliterated.

Loc. South Australia: 7 miles S.W. from Newland Head, Encounter Bay, 20 fathoms, 22.11.1906.

PETRALIA HALEI (7) sp. nov.

Fig. 35.

? Mucronella vultur MacGillivray (non Hincks), Trans. Roy. Soc. Victoria, iv, 1895, p. 99, pl. xiii, fig. 4.

Description. Zoarium massive and heavily calcified. Zooecia large and prominent, separated by faint though distinct margins. Frontal zooecial walls ovate, punctured with large circular and slit-like pores.

The zooecial aperture is arched above and slightly constricted inwards laterally as in *P. dorsiporosa.* The proximal border may be either straight or slightly incurved, and it sometimes possesses two blunt outwardly projecting teeth. Each proximal angle of the aperture is conspicuously sinuated, as in *P. vultur.* The distal half of the frontal zooecial wall below the aperture is raised in the form of a massive, blunt, umbonate structure, on the side of which is a deep avicularian cavity or chamber. Judging by this cavity the mandible must be of considerable size, but, unfortunately, no account of it can be given, owing to the incomplete state of the single specimen before me. Six circular pores, arranged at even distances apart, occur on the distal border of the aperture, indicating that the species possesses spines.

The species is described from a single fragment without ooecia, opercula, or mandibles to the avicularia, but the existing characters mark the form as a new species.

(7) Named for Mr. Herbert M. Hale, Curator, South Australian Museum.

Loc. South Australia: Beachport, 26.12.1905.

Affinities. *P. halei* can be readily recognized by the large size of the zoarium as well as by the character of the gigantic and heavily calcified muero below the aperture. The zooecial apertures of *P. halei* are also more conspicuous than any other known species of the genus.

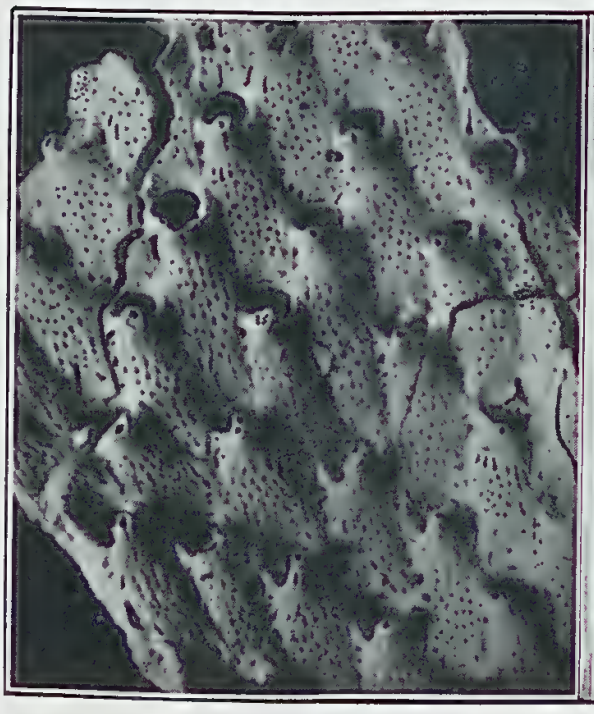

Fig. 34. *Petralia vultur.* Zooecial detail of a heavily calcified colony. *Photo, G. C. Clutton.*

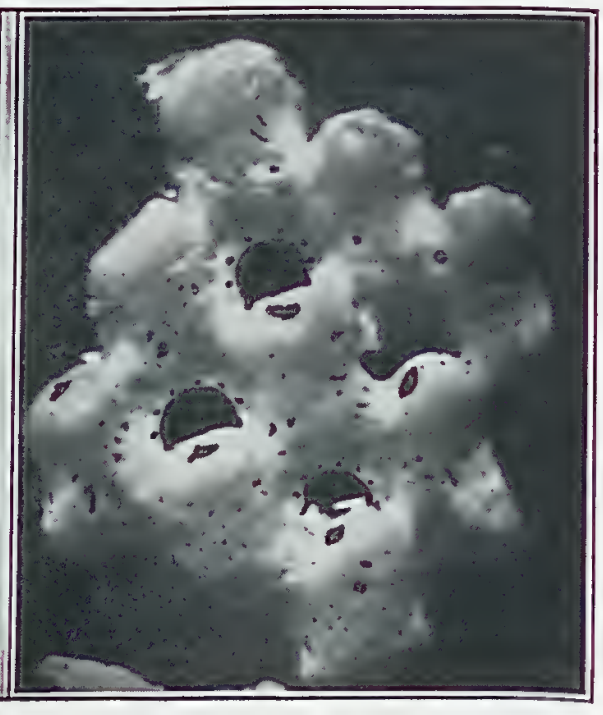

Fig. 35. *Petralia halei.* Zooecial detail. *Photo, G. C. Clutton.*

Remarks. MacGillivray *(loc. cit.)* described a form from the Victorian Tertiary deposits which he considered doubtfully referable to *Mucronella vultur* Hincks (now *Petralia vultur*). After examining the large series of *P. vultur* in the Australian Museum collection I am of the opinion that the species could not, in any growth stage, be found to correspond with MacGillivray's description and figure in the above work. This being the case, to what species does MacGillivray's specimen belong? Judging from the specimens and data before me I am inclined towards the opinion that the species is the same as the new form before me, and therefore should be placed in its synonymy.

AMATHIA SPIRALIS Lamouroux.

Amathia spiralis Lamouroux, Hist. des. Polyp. Corall. Flex., 1816, p. 161, pl. iv, fig. 2.

Amathia spirális MacGillivray *in* McCoy, Prodr. Zool. Victoria, dec. xx, 1890, p. 307, pl. 185, fig. 2.

Loc. South Australia: 12 miles S.E. by S. from Newland Head, Encounter Bay, 24 fathoms.

SOUTH AUSTRALIAN CEPHALOPODA

By SIR JOSEPH C. VERCO, Hon. Conchologist, and BERNARD C. COTTON,
Assistant Conchologist, South Australian Museum.

Text figs. 36-38.

A list of the mollusca of South Australia, published in 1865 by G. F. Angas (1), included two species of Cephalopoda. J. Brazier (2), in 1892, enumerated six species from South Australia; in 1907 one of us (3) described the sepion of a new species; and A. R. Riddle (4), in 1920, recorded the occurrence of a *Nautilus;* S. Stillman Berry (5) described four new species in 1918 (5) and two more in 1921 (6).

The present paper gives a list of all the species recorded from South Australia, and of four found in adjacent Australian waters, and almost certainly occurring in South Australia. Two other species, hitherto not recorded from South Australia, are added.

Order TETRABRANCHIATA.

Family NAUTILIDAE.

Nautilus Linnaeus, 1758.

Nautilus pompilius Linnaeus.

Nautilus pompilius Linn., Syst. Nat., ed. x, 1758, p. 708; Riddle, Trans. Roy. Soc. S. Aust., xliv, 1920, p. 257.

A. R. Riddle recorded a living example from Foul Bay, Southern Yorke Peninsula.

Order DIBRANCHIATA.

Family OMMASTREPHIDAE.

Nototodarus Pfeffer, 1912.

Nototodarus gouldi (McCoy).

Ommastrephes gouldi McCoy, Prod. Zool. Vict., 1888, p. 255, pls. 169, 170. Victoria.

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(1) Angas, Proc. Zool. Soc., 1865, p. 155.
(2) Brazier, The Marine Shells of Australia and Tasmania, part i, Cephalopoda, 1892.
(3) Verco, Trans. Roy. Soc. S. Aust., xxxi, 1907, p. 213.
(4) Riddle, Trans. Roy Soc. S. Aust., xliv, 1920, p. 257.
(5) Berry, "Endeavour" Biol. Res., iv, 1918, p. 203.
(6) Berry, Rec. S. Aust. Mus., i, 1921, p. 347.

Nototodarus gouldi Berry, "Endeavour" Biol. Res., iv, p. 238.

The "Endeavour" took this species in the Great Australian Bight off Eucla, Western Australia; it therefore probably occurs in South Australian waters.

Family SPIRULIDAE.

SPIRULA Lamarck, 1799.

SPIRULA SPIRULA (Linnaeus).

Nautilus spirula Linn., Syst. Nat. ed. x, 1758, p. 710.
Ammonia laevis Gray, G..F. Angas, Proc. Zool. Soc., 1865, p. 157.

Common along all the beaches in South Australia.

Family IDIOSEPIIDAE.

IDIOSEPIUS Steenstrup, 1881.

IDIOSEPIUS NOTOIDES Berry.

Idiosepius notoides Berry, Rec. S. Aust. Mus., i, 1921, p. 361.

Berry records an example from Goolwa.

Family SEPIOLIDAE.

ROSSIA Owen, 1834.

ROSSIA AUSTRALIS Berry.

Rossia australis Berry, "Endeavour" Biol. Res., iv, 1918, p. 253, pl. lxix, figs. 3, 4; pl. lxx.

The "Endeavour" secured specimens in the Great Australian Bight, south of Eucla, and from Gabo Island to Everard Grounds, Victoria. The species therefore probably occurs off South Australia.

SEPIADARIUM Steenstrup, 1881.

SEPIADARIUM AUSTRINA Berry.

Sepiadarium austrina Berry, Rec. S. Aust. Mus., 1, 1921, p. 354.

St. Vincent Gulf.

SEPIOLOIDEA d'Orbigny.

SEPIOLOIDEA LINEOLATA (Quoy & Gaimard).

Sepiola lineolata Quoy & Gaim., Voy. Astrolabe, ii, 1832, p. 82, pl. v, figs. 8-13.
Sepioloidea lineolata Meyer, Fauna Sudwest Aust., 11, 1909, p. 330, fig. 3.

Meyer recorded this species from St. Vincent Gulf.

Family SEPIIDAE.

MESEMBRISEPIA Iredale, 1926.

MESEMBRISEPIA CHIROTREMA (Berry).

Sepia chirotrema, "Endeavour" Biol. Res., iv, 1918, p. 268, pl. lxxiv, figs. 3-9; pl. lxxv-lxxvii.

This species was dredged off Kangaroo Island by the "Endeavour."

MESEMBRISEPIA NOVAEHOLLANDIAE (Hoyle).

Sepia australis d'Orbigny, Ceph. Acet., p. 285, Seiches, pl. vii, fig. 4 (preocc.).
Sepia novaehollandiae Hoyle, Proc. Roy. Physical Soc. Edin., xvii, 1909, p. 266.

The type was from Kangaroo Island.

GLYPTOSEPIA Iredale, 1926.

GLYPTOSEPIA HEDLEYI (Berry).

Sepia hedleyi Berry, "Endeavour" Biol. Res., iv, 1918, p. 258.

The type locality is "South of Kangaroo Island, South Australia."

ARCTOSEPIA Iredale, 1926.

ARCTOSEPIA BRAGGI (Verco).

Sepia braggi Verco, Trans. Roy. Soc. S. Aust., xxi, 1907, p. 213, pl. xxvii, fig. 6.

Collected in St. Vincent Gulf by W. L. Bragg.

AMPLISEPIA Iredale, 1926.

AMPLISEPIA APAMA (Gray).

Sepia apama Gray, Cat. Moll. Brit. Mus. (Cephalopoda), 1849, p. 103.

The type was found at Port Adelaide.

SEPIA Linnaeus.

SEPIA DANNEVIGI Berry.

Sepia dannevigi Berry, "Endeavour" Biol. Res., iv, 1918, p. 258.

Berry records this form from South and Western Australia. As the above genera, introduced by Iredale, were founded solely on features of the sepion, and since this is unknown, we are unable to determine the genus in which this species should be placed.

Family CIRROTEUTHIDAE.

OPISTHOTEUTHIS Verrill, 1883.

OPISTHOTEUTHIS PERSEPHONE Berry.

Opisthoteuthis persephone Berry, "Endeavour" Biol. Res., iv, 1918, p. 284, pl. lxxxi, figs. 6, 7; pl. lxxxii, figs. 9, 10; pl. lxxxv-lxxxviii.

This species was found off Genoa Peak, Victoria, and off Eucla, Western Australia, so that it probably occurs off the coast of South Australia.

OPISTHOTEUTHIS PLUTO Berry.

Opisthoteuthis pluto Berry, "Endeavour" Biol. Res., iv, 1918, p. 284, pl. lxxxi, figs. 4, 5; pl. lxxxii, figs. 5-8; pl. lxxxiii-lxxxiv.

Taken in the Great Australian Bight and off the coasts of South and Western Australia.

Family ARGONAUTIDAE.

ARGONAUTA Linnaeus, 1758.

ARGONAUTA NODOSA Solander.

Argonauta nodosa Solander, Portland Cat., 1786, p. 76.

Argonauta oryzata Meuschen, G. F. Angas, Proc. Zool. Soc., 1865, p. 156.

This common species has been taken in Spencer Gulf and off Kangaroo Island.

Family POLYPODIDAE.

POLYPUS Schneider, 1784.

POLYPUS PICTUS (Brock).

Octopus pictus Brock, Zeitschr. F. Wiss. Zool., xxxvi, 1882, taf. xxxvii, fig. 3; Hoyle, Zool. Challenger, xvi, 1886, p. 93 (non *Octopus pictus* Verrill).

Hoyle recorded this species from Kangaroo Island.

POLYPUS VARIOLATUS (Blainville).

Octopus variolatus Blainville, Dict. Sci. Nat., v, 1826, p. 186, taf. xliii.

Polypus variolatus Berry, "Endeavour" Biol. Res., iv, 1918.

The "Endeavour" specimens were obtained in Western Australia and Victoria, and is therefore probably found in South Australia.

Family LOLIGINIDAE.

SEPIOTEUTHIS Blainville, 1824.

SEPIOTEUTHIS AUSTRALIS Quoy & Gaimard.

Sepioteuthis australis Quoy & Gaim., Voy. Astrolabe Zool., ii, 1832, p. 77, pl. 4, fig. 1; Berry, "Endeavour" Biol. Res., iv, 1918, p. 249, figs. 39-42 (refs.).

Berry lists the following localities: Darnley Is., N. Aust. (Gray); Port Jackson, N.S. Wales (Gray); Western Port, Vict. (Quoy & Gaim.); Port Phillip, Vict. (McCoy); Mermaid Straits, W. Aust. (Von Martens); Australian Seas (Endeavour).

This species appears to be quite common in South Australia. The specimens examined were obtained from Second Valley, Port Parham, Port Lincoln, and Port Noarlunga, taken in the seine net. Fishers with rod and line take it with the "jag," off the piers, further up the Gulf, for bait.

The largest specimen examined measures in total length from the tip of the tentacular arms to the aboral end of the body 670 mm., and the smallest 490 mm.

The epidermis is thin and colourless, and readily peels off the surface, exposing a deeper layer containing red, pink, and black spots of various shapes and sizes. The flesh below this is milky white, becoming yellowish on exposure.

Accurate measurement of these animals is practically impossible, owing to their flexibility and their liability to distortion in preservative.

	Females. %	Males. %
Dorsal length of body	100	100
Ventral length of body	95	93
Width of single fin at widest point ..	20	19
Width across fins at widest point near middle	62	60
Width of body in same region	24	23
Width of body at anterior third	26	25
Length of head	19	16
Length of funnel (median)	20	22
Length of right dorsal arm	31	32
Length of left dorsal arm	30	32
Length of second right arm	39	40
Length of second left arm	39	40
Length of third right arm	47	47
Length of third left arm	48	48
Length of right ventral arm	49	47
Length of left ventral arm	48	47
Length of left tentacle club	35	39

The above table gives the proportionate lengths of the various parts of the specimens expressed as percentages of the dorsal length of the body, both in the female and the male. To make the table more accurate the average dimensions of two similarly preserved specimens of each sex were taken. As the tentacular arms are retractile, and in different individuals are found retracted in various degrees, their measurement is useless for comparison, and is therefore omitted.

It will be seen from the table that there is little difference in shape between the male and female, and no marked difference in size has been recognized. The females appear to be fewer than the males, for of fourteen specimens taken at Port Lincoln only two were females.

The length of the sessile arms from greatest to least is in the order, 4=3, 2, 1.

In Berry's specimen, 4, 3, 2, 1. McCoy gives the order 3, 4=2, 1, and Ferrusac and d'Orbigny, 3, 4, 2, 1.

The acetabula or suckers on the tentacular club number 128, and are largest about its middle. Each sucker is provided with a horny ring, which may attain 7·5 mm. in diameter, strengthened by a central external rib. The ring may be twice to four times as deep on one side of the sucker as on the other, and is furnished along its superficial margin with 22 to 27 small, pointed teeth, curved slightly towards the centre, irregularly spaced, and larger where the ring is deeper. The suckers on the sessile arms do not reach the size of the largest on the tentacular arms. The rings on the former do not exceed 4 mm. in diameter, are twice as deep on one side as on the other, have a similar central rib, and have from 25 to 30 teeth, which are more closely set and comparatively larger, though actually smaller than those of the tentacles.

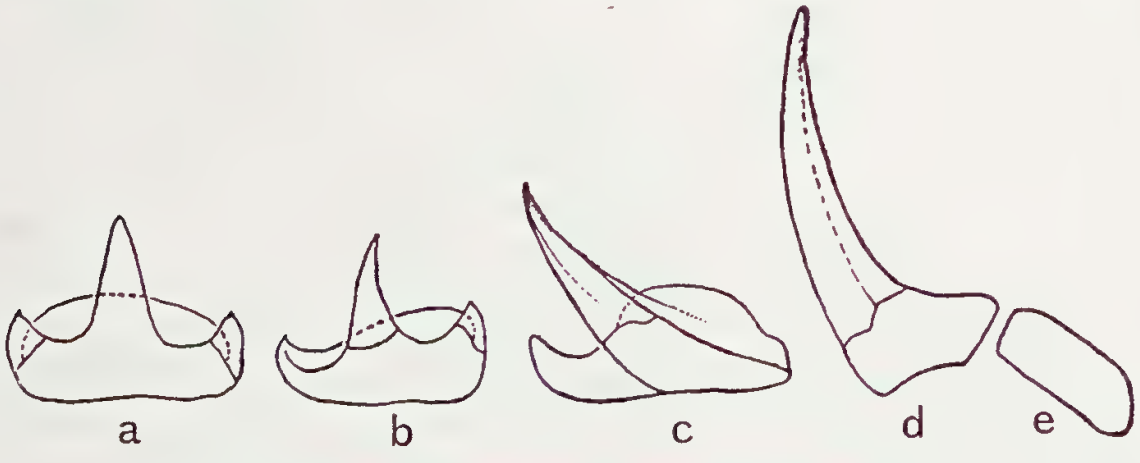


Fig. 36. Radula of *Sepioteuthis australis* (enlarged).

The hectocotylus is as usual in the genus. It affects the terminal eighth of the left ventral arm, where its suckers are replaced by two rows of papillae, about seventeen in each, the dorsal row being of distinctly larger size.

The dorso-ventral median line of the mandibles in three of our specimens does not lie vertically, but obliquely between the roots of the first and second right dorsal arms, and in one case between the first and second left dorsal, showing that the animal can rotate its buccal mass horizontally and independently of the rest of the head.

The beaks are black for some distance from their points, and then become abruptly of a fawn colour, which fades away entirely before the margins are reached. The outer wings are comparatively narrow, the inner much wider, especially those of the long upper mandible, and are separated widely from the rest of the mandible for the accommodation of a large mass of muscle and connective tissue.

The radula (fig. 36) consists of about sixty-eight transverse rows of teeth arranged in seven distinct lines, and outside the bases of the outer lines is a faint corresponding line of accessory plates. All the teeth are erect, and curved from the mouth towards the gullet. Their tips are on the same horizontal plane, except those of the first laterals, which are slightly lower, due to their smaller size. The radula cushion is convex in transverse section, which explains the

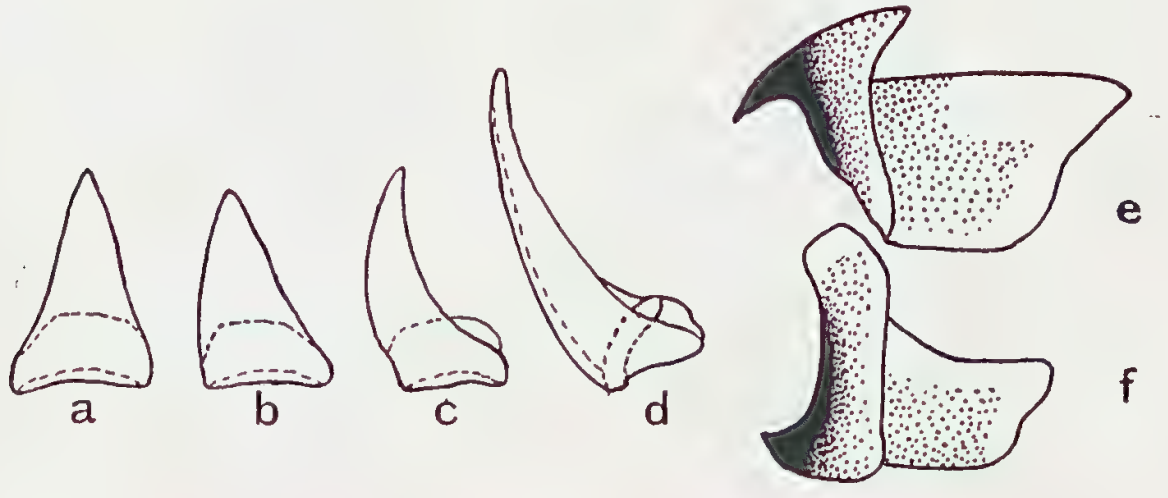


Fig. 37. Radula and beaks of *Euprymna tasmanica* (enlarged).

horizontal plane of the tips of the teeth, although they increase in length from the central to the external lateral line; and also the overlapping of the outer two lines of teeth on each side, when the radula is flattened out on the microscope slide. The radula bends back on itself at its middle, and the posterior half lies in a saccule at the entrance to the gullet. The rachidian tooth (a) has a sharp central cusp and a much smaller cusp at each end of the base. The first lateral (b) has a slightly smaller central cusp, and a small cusp at the outer end of the base, the inner end of which is curved slightly upwards. The second lateral (c) has a considerably longer central cusp, a rather large base, blunt on the outer side, and somewhat curved upwards at the inner end. The third lateral (d) is long and curved, with a small base produced at the outer end, where it is hinged, and can be turned inwards or outwards. It is drawn turned inwards in the figure. The marginal accessory plate (e) is elongately oblong, and directed backwards at an angle of 45°, and appears to be the external lateral devoid of a cusp. Careful microscopic examination indicates that each tooth has a wide basal plate, which is inserted in the basal membrane of the radula, and which is so much larger than the base of the tooth that it can be seen beyond the latter and through the cusp or cusps of the tooth.

Family SEPIOLIDAE.

EUPRYMNA Steenstrup, 1887.

EUPRYMNA TASMANICA (Pfeffer).

Sepiola tasmanica Pfeffer, Ceph. Hamb. Mus., 1884, p. 6, fig. 7.

The type was taken in Bass Strait, but in the South Australian Museum there is a female preserved in formalin taken by H. M. Hale and F. R. Zietz at Brighton, South Australia. The measurements are given in the accompanying table. The arms are all more or less damaged, and the third right arm is missing, so that these dimensions cannot be accepted as typical.

MEASUREMENTS.

Aboral end to mantle opening	32·5 mm.
Width of body across mantle opening	29·0 mm.
From aboral end to tip of beaks	33·4 mm.
From mantle opening to tip of funnel	18·0 mm.
Width of fin at widest point: Right	5·4 mm.
Width of fin at widest point: Left	5·3 mm.
Greatest length of fin: Right	12·2 mm.
Greatest length of fin: Left	12·3 mm.
Length of attachment of fin to body: Right	11·0 mm.
Length of attachment of fin to body: Left	11·0 mm.
Length of right dorsal arm	28·0 mm.
Length of left dorsal arm	28·0 mm.
Length of right second arm	32·0 mm.
Length of left second arm	32·0 mm.
Length of right third arm	—
Length of left third arm	32·0 mm.
Length of right ventral arm	30·0 mm.
Length of left ventral arm	28·0 mm.
Length of right tentacle (approximate)	67·0 mm.
Length of left tentacle (approximate)	66·0 mm.

The original illustration of Pfeffer's type consists only of an outline of the body without head or arms; consequently a photograph of the specimen from St. Vincent Gulf is given in fig. 38. Pfeffer's outline shows the left fin as being slightly nearer to the aboral end of the body than is the right fin, a peculiarity seen in the South Australian specimen.

The radula (fig. 37) has about sixty transverse rows, each with seven teeth. The rachidian (a) is triangular, with a lunar-shaped base, which can be seen through the tooth. The first lateral (b) is similar to the rachidian, but somewhat shorter, and pointing slightly inwards. The second lateral (c) consists of a single curved cusp as long as the rachidian, the base projecting beyond the outer

margin of the tooth. The third lateral (d) is much longer, sickle shaped, with a similar base.

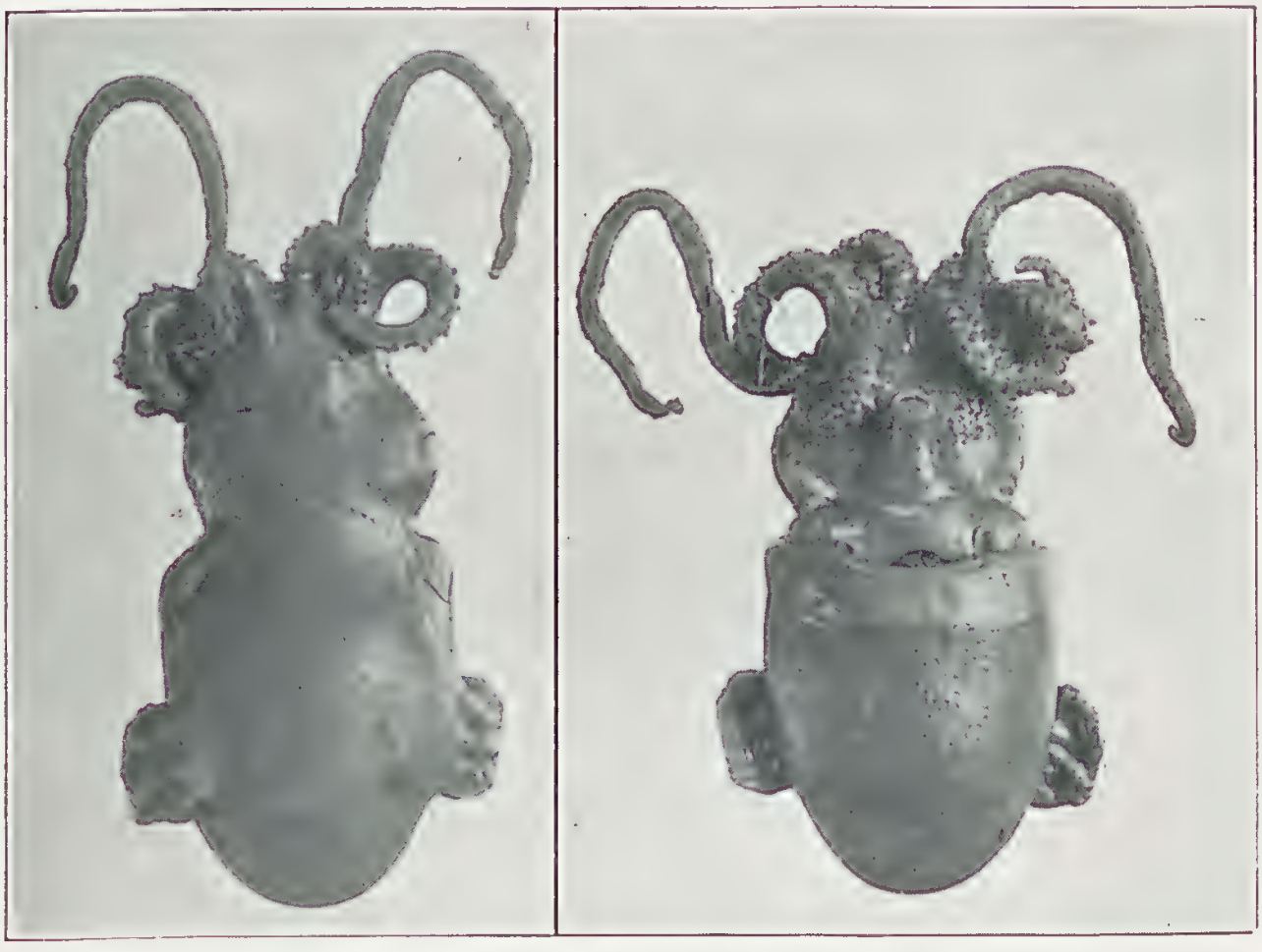
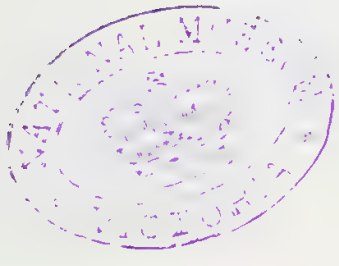


Fig. 38. *Euprymna tasmanica;* dorsal and ventral views (nat. size).

The beaks (fig. 37; e, dorsal, and f, ventral) are black at the tips, fading rapidly into brown; colourless near the margins.

The above species approaches *Eupryma stenodactyla Grant,* but this is much smaller, has proportionally larger fins, a more globose, less cylindrical body, a very constricted neck, and a different colour pattern.



NEW TREMATODES FROM THE AUSTRALIAN WATER-HEN, *GALLINULA TENEBROSA*

By Professor T. HARVEY JOHNSTON.

Text figs. 39-40.

Catatropis gallinulae n. sp.

Fig. 39.

A few trematodes, referable to Odhner's genus *Catatropis* (Notocotylinae), were found in the caecum of *Gallinula tenebrosa* Gould from the vicinity of Adelaide in 1926. Their maximum dimensions are as follows: 1·25 by 0·65 mm., 1·9 by 0·9 mm., 2·1 by 0·95 mm., 2·1 by 1·1 mm., eggs being present in all specimens. The greatest width occurs in the mid region and postern half, the worms tapering more anteriorly than posteriorly, where they are rather broadly rounded. The cuticle is minutely scaly. Ventral glands are arranged as a series of eight or nine groups longitudinally near the region of each intestinal crus, but they do not project, nor are they obvious in stained or unstained preparations. The median row was not recognized.

The oral sucker is practically terminal, measuring 0·18 to 0·2 mm. in maximum diameter, with a cavity of 0·1 to 0·13 mm. in diameter. A pharynx is absent. The oesophagus measures 0·08 mm. in length. The intestinal cura extend almost to the posterior end of the parasite, and exhibit small irregularities along their walls. They skirt the outer limits of the uterine coils very closely, and in the vicinity of the anterior part of the testes curve in such a way as to travel close to the mesial border of those organs, the ends turning inwardly not far from the excretory pore.

The excretory system is typical of the genus. The aperture is very small, and leads into a very wide U-shaped trunk, whose limbs lie laterally to the intestine and to most of the vitelline follicles, and eventually pass forward to the side of the oral sucker, where the two approximate very closely, but communication was not traced.

The slightly lobed testes extend from the rear edge of the uterine coils somewhat obliquely backwards, to end some distance in front of the termination of the intestinal cura. In front they almost or just reach the vitelline field. The vas deferens is median and very obvious in the anterior half of the uterine

zone, above which it lies. It then curves to the right in front of the uterine loops, reaching the intestine, and then sharply curving back, almost on itself, finally entering the cirrus sac. The latter measures 0·48 by 0·12 mm. and 0·50 by 0·10 mm. in two cases where the cirrus was fully retracted, and 0·37 by 0·1 mm. in a specimen in which the cirrus was more or less fully protruded.

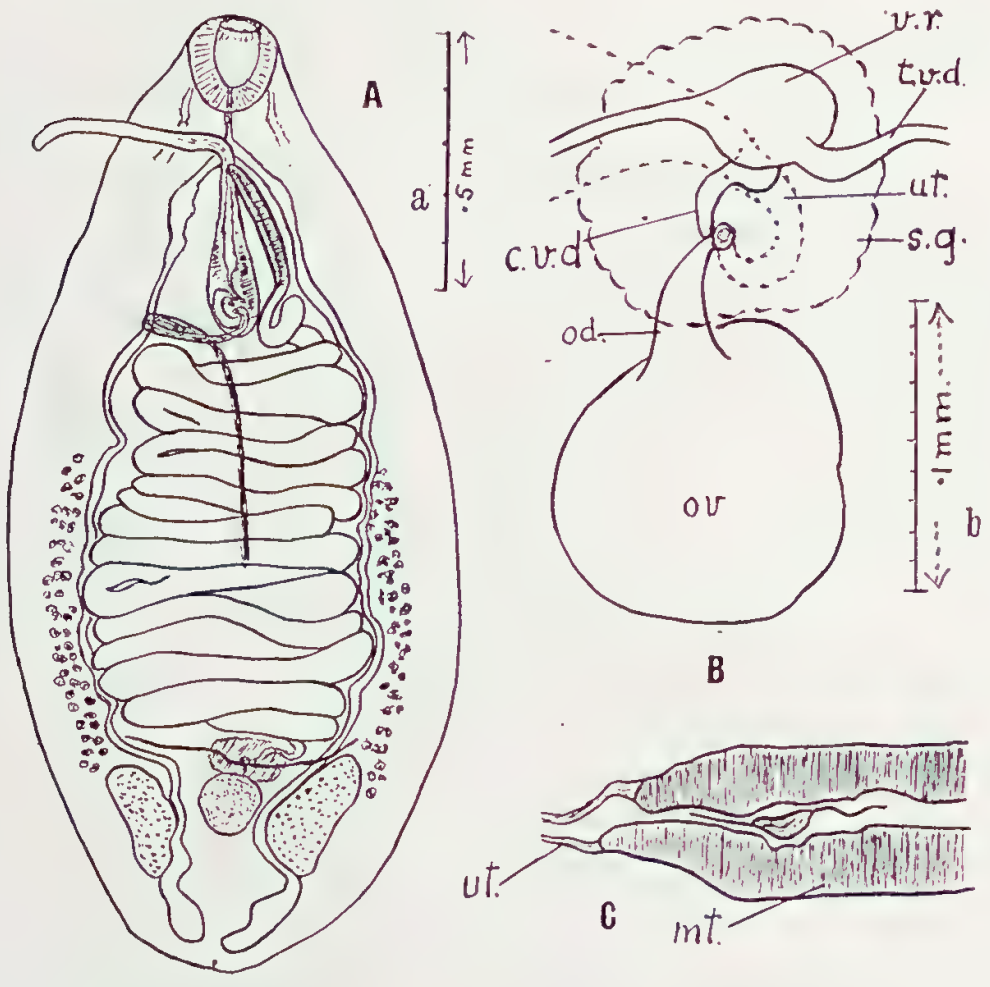


Fig. 39. *Catatropis gallinulae*: A, ventral view of entire specimen; B, female complex, ventral; C, junction of uterus and metraterm, with egg in the latter. (A to scale a; B and C to scale b.)

Explanation of lettering: c.v.d., common vitelline duct; e., eggs; ex.c., excretory canal; L, Laurer's canal; mt., metraterm; od., oviduct; oot., ootyp; ov., ovary; s.g., shell-gland; t., testis; t.v.d., transverse vitelline duct; ut., uterus; v.g., vitelline glands; v.r., vitelline reservoir.

The posterior end is broadly rounded, and within it the male duct is somewhat widened and coiled as a vesicula whose walls are glandular and deeply staining. The cirrus has abundant delicate transverse striations. When everted it may reach a length of 0·43 mm., with a diameter of 0·05 to 0·06 mm. It is covered with numerous relatively large flattened scales or broad spines, which may project about 0·01 mm. from the surface. The male aperture lies directly above

the genital pore, which is situated immediately behind, or even just below, the intestinal bifurcation.

The almost round ovary is 0·12 to 0·13 mm. in diameter, and closely approaches the intestinal cura between the testes. The oviduct, which is very short and comparatively wide, arises from its anterior border, and enters the short dorsoventrally placed ootyp, surrounded by the shell gland. The latter has a transverse diameter of 0·12 to 0·13 mm., and lies very close to the front of the ovary.

The uterus widens almost immediately after it leaves the ootyp, forms a curve or loop below the shell gland, and then travels toward the left, becoming thrown into a series of about twelve or thirteen wide, close coils, filling the region between the intestinal crura, and reaching almost to the posterior end of the cirrus sac. This uterine field is almost 0·8 mm. long in a specimen of 1·9 mm. in length. At the side of the cirrus sac the uterus becomes modified into a metraterm 0·30 to 0·40 mm. on length, which is approximately parallel to the sac, but at a more ventral level, actually crossing below it in the region of the genital pore. It has very thick walls, 0·025 mm. thick, the tube measuring about 0·06 mm. in diameter. These walls are strongly muscular, and possess abundant very delicate striations resembling striated muscle, similar to, but much more abundant than, those in the wall of the cirrus sac.

The vitelline glands are arranged in lateral fields about 0·6 mm. long, and lie in the posterior half of the worm, commencing at about midway. They do not extend further back than the anterior part of the testes, so that the posterior fifth of the parasite is free from yolk follicles. The longitudinal yolk ducts eventually open into the transverse duct, which lies between the corresponding testis and uterine loop, the duct becoming widened in the mid-line above the shell glands, just in front of the ovary, to form a well-marked vitelline reservoir. From the latter a short common yolk duct passes backwards and downwards, curving slightly to enter the ootyp. Laurer's canal was not observed. Eggs possess long polar threads, and measure 0·020 to 0·023 by 0·012 mm., excluding the filaments.

The genus is now recorded for the first time as being present in Australia. *C. gallinulae* seems to be related closely to *C. verrucosa* (Frol.) and *C. charadrii* Skrjabin from European birds, but differs from them in possessing a more narrowed anterior half of the body; a greater width in the posterior half; fewer and longer uterine loops; more compact testes, which do not approach the posterior end so closely as in the two species mentioned; and, besides the Australian parasite is very much smaller than either of the others. The ratio

of length to maximum breadth is about 2 : 1 in *C. gallinulae*, 4 : 1 in *C. charadrii*, and 2 to 3 : 1 in *C. verrucosa*.

The general form and organography remind one of those of *Notocotylus gibbus* (Mehlis), as described by Kossack. The sizes are fairly similar, and both occur in the caeca of species of *Gallinula*. In this European species there are only six to eight glandular groups in each series, and these scarcely project. Though the metraterm is considerably shorter than the cirrus sac, it is relatively much longer than in the other species of *Notocotylus*, and this fact, together with the very feeble development of glandular papillae, suggests that the species should be more correctly assigned to *Catatropis*. *C. gallinulae* differs from *C. gibbus* chiefly in the relative lengths of the sex ducts and in the closer approximations of the sex glands, and the ends of the intestinal crura to the posterior extremity of the worm in the case of the former species.

The type slide has been deposited in the collection of the South Australian Museum (Reg. No. E. 656).

ECHINOSTOMA AUSTRALE n. sp.

Fig. 40, A-C.

A single specimen of an *Echinostoma* (Echinostominae) was found in the caecum of *Gallinula tenebrosa* from Adelaide. It measured 10·2 mm. in length by 1·5 mm. in width (which was fairly constant throughout the worm), the narrowing of the region anterior to the ventral sucker being very slight until the extremity of the large collar was reached, where the width was 1·0 mm., diminishing more rapidly anteriorly, being 0·5 mm. at the junction with the collar.

The collar is large, measures 0·85 mm. long by 1·0 mm. broad, is rather deeply incised, with its ventral lobes broadly rounded. The greatest breadth occurs in the mid-region. The arrangement of spines in two rows is hardly recognizable. They total about 32, of which four occur in each lobe, and measure about 0·08 mm. in length. The remainder are markedly marginal, those in the posterior two-thirds being longer (0·07 to 0·08 mm.) than the remainder (0·03 to 0·06 mm.), though all are rounded at their free extremities.

The anterior sucker measures 0·55 mm. in diameter by 0·45 mm. in length. The front of the funnel-shaped acetabulum is situated about 1·3 mm. from the anterior end of the worm, and measures 1 mm. across by 1 mm. in length. The ratio of the diameters of the anterior and ventral suckers is thus about 1 : 1·8. The ratio of the distance between the anterior ends of the two suckers to the body length is 1 : 7·8.

The short prepharynx is followed by a pharynx, 0·3 mm. long by 0·2 mm.

wide, and a long, narrow oesophagus, which divides immediately in front of the acetabulum into two very narrow simple intestinal crura lying below the vitellaria.

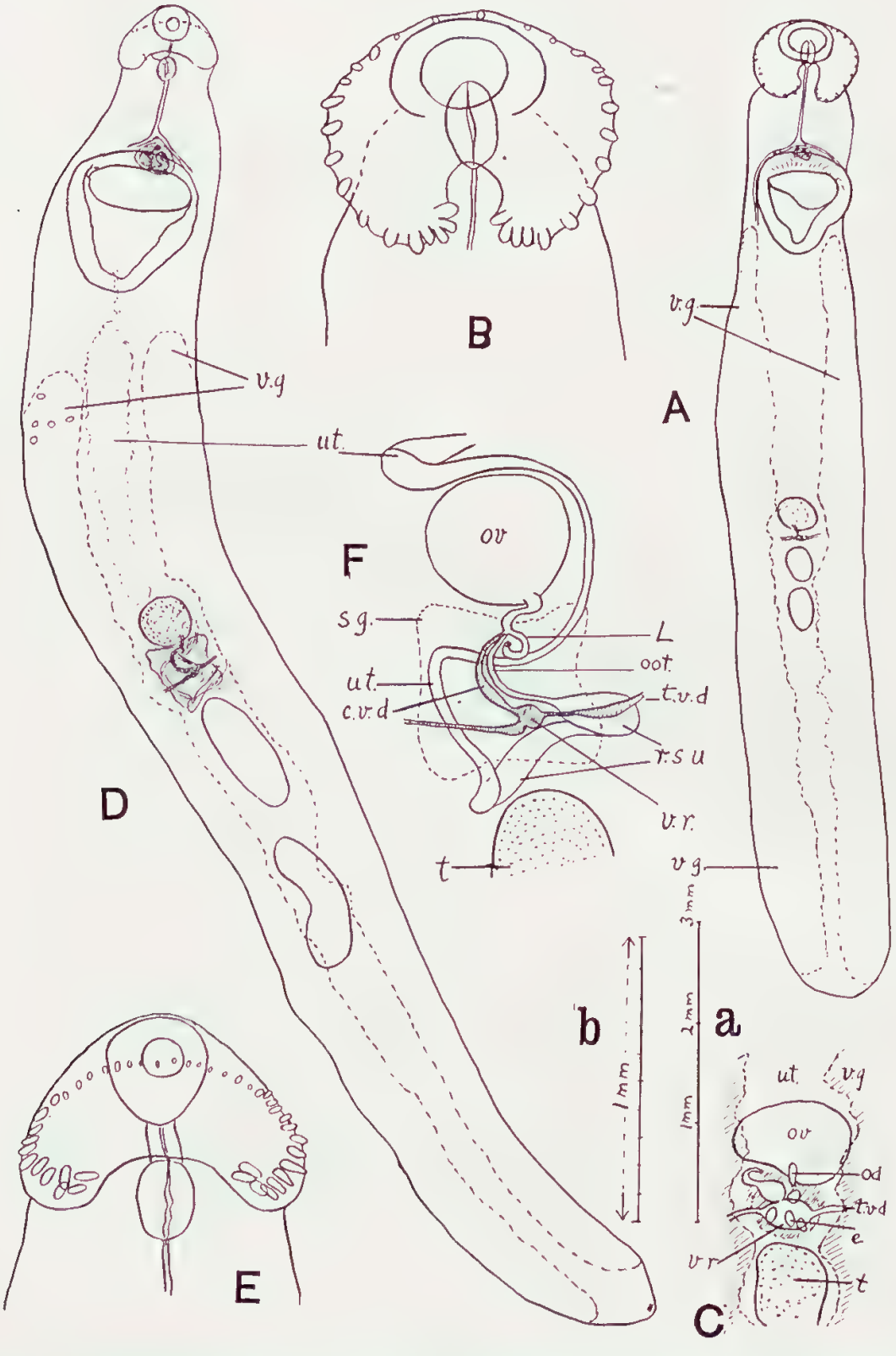


Fig. 40. *Echinostoma australe*: A, entire specimen; B, anterior end, ventral; C, female complex, dorsal.

Echinostoma bancrofti: D, entire specimen, compressed; E, anterior end, ventral; F, female complex, dorsal. (A and D to scale a; B, C, E, and F to scale b.)

The testes are median, close to one another, and almost elliptical. The anterior measures 0·4 by 0·2 mm., and the posterior 0·4 by 0·24 mm., the front of the former lying at 5·3 mm. from the anterior end of the parasite, i.e., almost at mid-length. The posterior edge of the second testes is 3·7 mm. from the corresponding end of the worm, the ratio of this distance to body length being 1 : 2·7. The cirrus sac and associated structures occupy a very small area of about 0·3 mm. in diameter, lying immediately behind the intestinal bifurcation and below the anterior wall of the ventral sucker. The details were not satisfactorily determined, but the vesicula seems to be larger than the very small cirrus sac. The genital pore is situated between the ventral sucker and the forking of the intestine.

The ovary measures 0·35 by 0·25 mm., and lies at 4·9 mm. from the anterior end. i.e., just in the anterior half of the parasite. The oviduct is very short. The relationships of the ootyp and receptaculum were not recognized. The uterus forms one or two loops below the shell gland, and then passes forwards to fill the space between the vitellaria, eventually becoming a very narrow tube, more or less median, lying above the acetabulum, and terminating on the right beside the cirrus sac. Eggs measure 0·08–0·10 mm. by 0·06–0·07 mm.

Vitellaria are very abundant, and extend backwards on each side from the sides of the posterior portion of the acetabulum as a dense mass of follicles (0·04 to 0·06 mm. in diameter) almost to the posterior end. The mid-region of the parasite is quite free of these glands, though the fields approach each other in places posteriorly. A few follicles were seen underlying the edges of the testes. The yolk ducts eventually form a short, fairly thick, transverse vitelline duct, which is swollen into a well-marked vitelline reservoir. From the latter a wide common yolk duct passes obliquely forwards, at first wide, but soon narrowing suddenly into a delicate duct, which curves ventrally to meet the ootype close behind the ovary. The shell gland measures about 0·15 by 0·3 mm., and lies between the vitelline reservoir and the uterine duct.

E. australe is closely related to *E. chloropodis* (Zeder) as figured by Dietz, the chief differences being in regard to the form of the collar as well as the number, size, and arrangement of the collar spines.

The type, mounted on a slide, has been deposited in the South Australian Museum (Reg. No. E. 657).

ECHINOSTOMA BANCROFTI n. sp.

Fig. 40, D-F.

This new species is based on a single flattened specimen, mounted as a slide, and collected from *Gallinula tenebrosa* at Eidsvold, Burnett River, Queensland,

by Dr. T. L. Bancroft and his daughter, Dr. M. J. Mackerras. The compression has resulted in an alteration of the dimensions and perhaps also of the disposition of the various organs, consequently it is with some hesitation that it is now described, but no doubt additional material may be procured in the future and allow correction of this account.

The specimen is 15·7 mm. by 1·7 mm. in maximum breadth, the width being practically constant from the vicinity of the acetabulum almost to the posterior end, where a gradual narrowing occurs, until the end of the vitelline region is reached, when there is a marked diminution in breadth to form a pointed termination. The cuticle is finely spiny, especially anteriorly. The width immediately behind the collar is 0·9 mm.

The collar is broadly lobed posteriorly, with the corners rather widely separated by a shallow bay. This organ is 0·7 mm. in greatest length and 1 mm. wide, the broadest portion lying behind the posterior border of the anterior sucker. The spines alternate in two series. Those in the anterior dorsal portion are quite small, and do not lie along the front border of the organ. There are four prominent corner spines, 0·1 mm. long, on each side, succeeded by others which gradually diminish in size on the more anterior portion. There are about 44 in all.

The anterior sucker is strongly muscular, and measures 0·35 mm. across by 0·37 mm. in length. The acetabulum is funnel-shaped, 1·3 mm. in maximum width, 1·4 mm. in length, with its opening about 1 mm. across. The distance between the anterior border of these two organs is 1·5 mm., i.e., about one-tenth the total body length; while their diameters are in the ratio of 1 : 3·7.

The wide prepharynx is very obvious. The rounded pharynx measures 0·13 mm. across, and is followed by a long oesophagus, 0·6 mm. long, which bifurcates just in front of the genital pore and acetabulum. The intestinal crura pass round the acetabulum, and come to lie below the vitellaria.

The testes are obviously compressed in the specimen, and appear as elongate, slightly lobed organs, the anterior commencing at about the mid-length of the worm. They both measure 1·3 to 1·4 by 0·5 mm. The distance between the posterior end of the rear testis and the posterior end of the parasite is 4·6 mm., i.e., about one-third the body length. The strongly muscular cirrus sac lies immediately below the anterior rim of the acetabulum, and together with the vesicula occupies an area about 0·4 mm. in diameter just behind the intestinal bifurcation and above the genital pore. The prominent vesicula is bent, but the specimen does not allow of a satisfactory examination of the sac, within which a long cirrus lies twisted.

The small rounded ovary measures 0·5 by 0·5 mm., and lies at 6·2 mm.

from the anterior end of the worm, the ratio of this distance to the total length being 1 : 2·5. The oviduct is short and rather thick, bends directly dorsally, and almost immediately enters the ootyp, which travels more or less at right angles to it behind the ovary, and then curves backwardly, to become a very thin-walled, narrow tube. The latter soon widens into a receptaculum seminis uterinum, containing sperms and developing eggs, this portion becoming thrown into a few loops below the shell gland and partly behind it just in front of the anterior testis, and eventually travelling forwards as a narrow uterus. The loops of the latter occupy most of the region between the vitellaria, ovary, and acetabulum. It ultimately passes forwards above the last-named to open at the genital aperture. The shell gland is obviously flattened out, and occupies most of the region between the ovary and the anterior testis. Laurer's canal is rather short, at first wide and curved, but becoming very narrow, and thrown into a short loop before it opens dorsally just above the oviduct. Eggs measure 0·08 to 0·11 mm. by 0·05 to 0·06 mm. The yolk follicles are very abundant, measuring 0·08 to 0·1 mm. in diameter, the glands extending from a short distance behind the base of the acetabulum almost to the posterior end of the parasite, forming a band about 0·5 mm. wide along each side. The transverse yolk ducts cross nearly midway between the rear of the ovary and the front of the anterior testis to form a yolk reservoir near the middle of the shell gland, and from this a common yolk duct travels obliquely forwards to enter the ootyp near the anterior edge of the shell gland.

The parasite is more closely related to *E. chloropodis* than *E. australe* is, and differs from it only in minor details, such as presence of a pointed posterior end, fewer collar spines, smaller anterior collar spines, larger receptaculum seminis, smaller vitelline follicles, larger collar. The ratio of the diameters of the two suckers is practically identical. It is quite possible that the examination of better material may show that *E. bancrofti* is synonymous with *E. chloropodis*.

The type slide has been deposited in the South Australian Museum (Reg. No. E. 658).

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PRELIMINARY NOTE ON THE LIFE HISTORY OF *SYNEMON* (LEPIDOPTERA, FAM. CASTNIIDAE)

By NORMAN B. TINDALE, S.A. Museum.

The members of the family Castniidae are found almost exclusively in South America and Australia. The life-history is known in a few exotic species only, one of which is an internal feeder in the bulbs of orchids. The Australian species, all of which belong to the genus *Synemon*, are day-fliers, superficially resembling butterflies in shape, colour, and flight. Their life-history has been a puzzle to entomologists for many years.

On November 16, 1927, while collecting at Highbury, about ten miles north-east from Adelaide, in company with Mr. J. D. O. Wilson, freshly emerged examples of the brilliant orange and black *Synemon sophia parthenoides* Felder were captured. They were flying low over a sandy swamp amongst low tussocks of a grass *(Amphipogon strictus)* and a sedge *(Lepidosperma carphoides)*.

The moths were mating freely in the hot sunshine at noon, the males pursuing the females, which were usually to be seen flying close to the ground. When one of the latter settled, head upwards, with open wings, upon a grass stem, a male alighted below her with wings drooped, and advanced slowly up the stem on the opposite side until facing and on a level with her. Copulation took place in this attitude; on being disturbed they flew a few yards away and remated in the same manner.

Search in the vicinity revealed abandoned pupal skins projecting from slightly oval, silk-lined holes in the sandy ground, in a similar manner to the larger cases of root-feeding Hepialidae such as *Pielus*. A close examination showed *Synemon* wing-scales adhering to the insides of these shells. The shafts from which the skins projected were vertical for some 60 mm., about 7 mm. in greatest diameter, and closed by a cap of silk, covered with sand, which had been pushed up like a hinged lid during the exit of the moth. At the lower end the silk-lined shaft was somewhat constricted and connected with a horizontal tunnel leading towards the roots of an adjacent clump of *Lepidosperma*.

On November 23 (again in the company of Mr. Wilson) the tunnels were traced definitely to the roots of the sedge, where characteristic holes were noted in the bases of the stems. After much digging, a whitish, rather inactive larva was discovered, secreted in a silken chamber amongst the roots of a sedge. Subsequently it was found that tussocks of *Lepidosperma* attacked by the larvae

were more easily pulled up than sound ones, owing to the extensive injuries caused to their root system. More than a dozen larvae, varying in length from 10 mm. to 24 mm. were located, but no living pupae were found.

All the moths flying on this day were worn, and it was evident that the season was nearly finished. The females had evidently almost completed egg-laying; no act of deposition was observed, but mature eggs were dissected from one example.

The eggs are creamy-white, oblong-elliptic in shape (2·7 x 0·9 mm.), bearing numerous longitudinal ridges, between which are many transverse impressions.

The larvae are short, stout, cylindrical, with the anterior segments much swollen; the head is small, and the legs and prolegs are feebly developed. The body is white in colour, with the head and appendages darker.

The pupal skin is 23 mm. in length, light castaneous in colour, with the abdominal segments darker. The dorsal half of each abdominal segment bears a median transverse row of stout elevated spines resembling those of some Hepialid pupae.

A detailed account of the life-history and a study of the pupal wing-venation will be given as soon as advanced larvae and living pupae are secured.

NOTES ON SOME HUMAN REMAINS IN THE LOWER MURRAY VALLEY, SOUTH AUSTRALIA.

By HERBERT M. HALE, Curator, and NORMAN B. TINDALE, Ethnologist,
South Australian Museum.

Figs. 1-249.

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I. INTRODUCTION.

This paper records preliminary observations regarding two adjacent sites, in the Lower Murray Valley, where human remains were associated with occupational debris; the chief interest in both cases is the possible bearing of the evidence on the antiquity of man in South Australia.

In Australia little research by systematic methods has been carried out on aboriginal camping-sites; in the present instance the work was undertaken along lines developed and approved in countries where similar investigations are carried on.

The localities concerned are in the vicinity of Old Devon Downs, seven

kilometres below Nildottie township; here there is, within a small area, the connected evidence recorded herein.

Our interest in this part of the Murray Valley was stimulated by the discovery by Mr. W. R. Roy, of New Devon Downs Station, of a human skeleton embedded in sand-rock. Portion of the calvarium had weathered out, with part of its matrix, and was given to the late Museum Director in January, 1928; the last-named died shortly after, and no record of the donor or locality was then available. The specimen was exhibited before the Royal Society of South Australia (Tindale, 1928, p. 248).

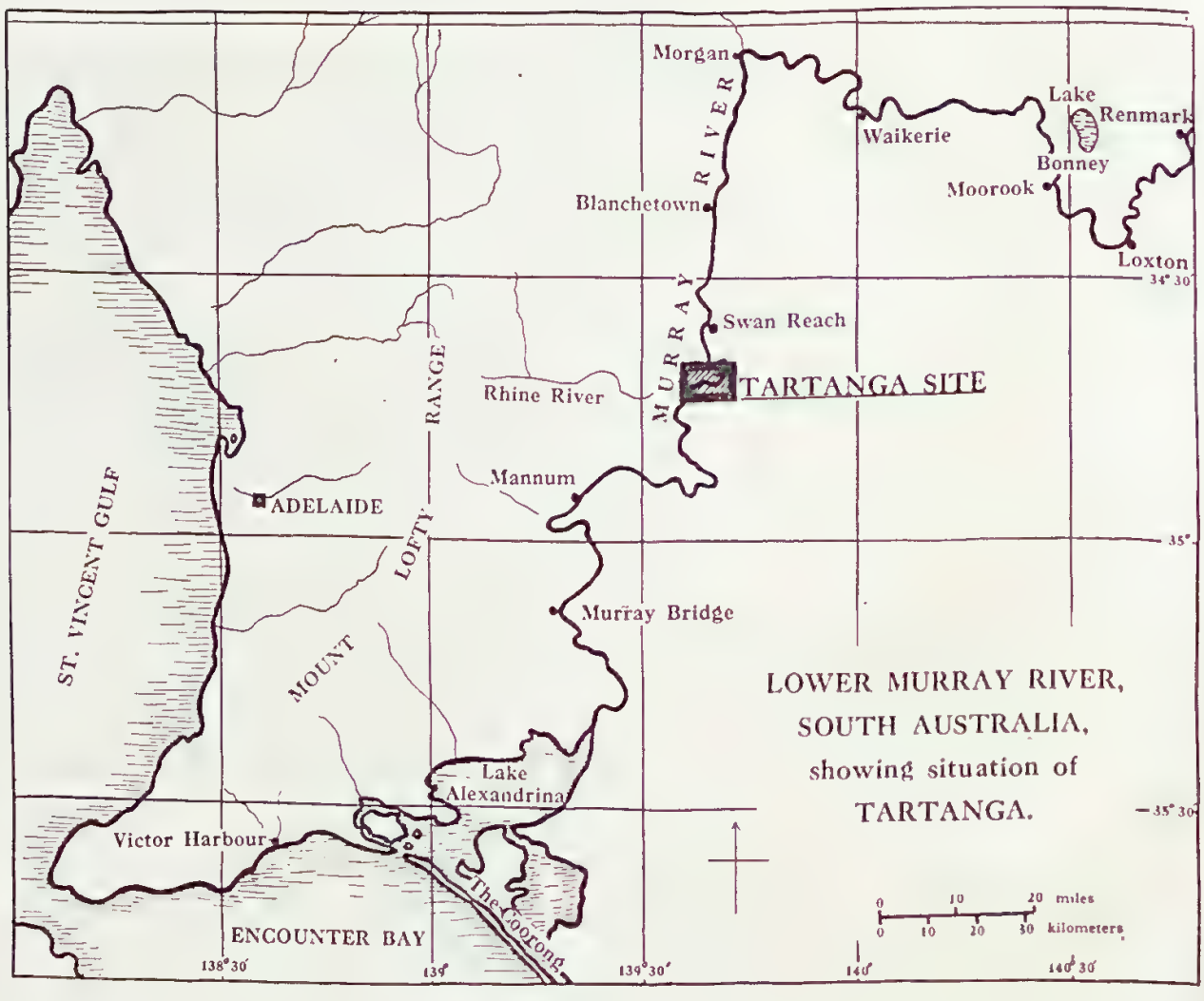

Fig. 1. Lower Murray River, South Australia. (For enlargement of Tartanga site see fig. 2.)

In April, 1929, Mr. Roy made enquiries regarding his donation, and the site was at once visited by the writers; a preliminary survey of two days indicated that the find might prove to be of consequence, and plans were outlined for more intensive work.

The bones were embedded in one of the lowest of a series of nine stratified

deposits, situated on a long, narrow island between the river and a lagoon at "Tartanga," in the Hundred of Ridley (figs. 1–2). The word "Tartanga" was the aboriginal name for part of the site, including the lagoon, and it has therefore been adopted. Several hundred examples of animal food remains, other camp debris and the human skeleton mentioned above were taken from the deposits.

Three weeks later a more extended survey was commenced. With the aid of assistants excavations were carried out, and detailed maps and sections of the locality were prepared; much other material, including portions of two further human skeletons, about two thousand examples of vertebrate and molluscan remains, and stone and bone artefacts, were then obtained from the Tartangan deposits.

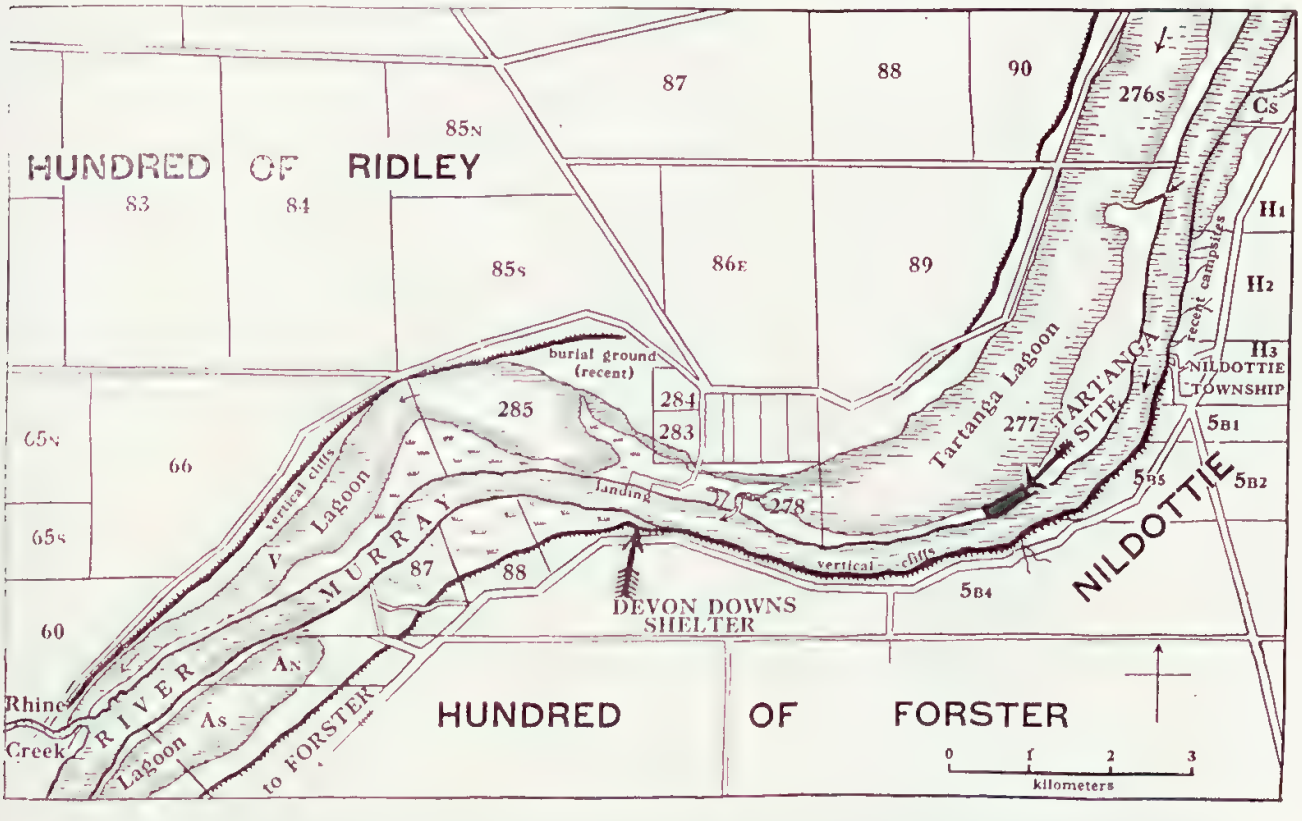

Fig. 2. Tartanga, Devon Downs and the vicinity, River Murray, South Australia.

Opposite Old Devon Downs, one and one-half kilometres west of Tartanga, there is a cliff-shelter, first described by Sheard (1927). It was considered desirable, at this stage, to also investigate the stratification of the debris in the shelter; the excavation of a narrow trench showed that occupational material extended to a depth of at least 5 metres. The bottom of the debris had not been reached at this depth, and the results were sufficiently striking to warrant additional research. Consequently, during November and December of 1929

the excavation was continued, on a much larger scale, to the bottom of the deposits.

The results of the excavations at Tartanga and Devon Downs are detailed below. It is perhaps advisable to state here that, in carrying out the whole of the work, no unskilled labour was requisitioned; all excavations were made by the authors personally, assisted by three trained scientific assistants who are also permanent officers of the South Australian Museum staff.

II. TARTANGA.

LOCALITY AND PHYSIOGRAPHY.

The site of Tartanga is on the south-eastern boundary of Section 277, Hundred of Ridley (fig. 2), and is situated on portion of a long and narrow spit between the river and a lagoon through which water is almost constantly flowing, although the direction of the flow may be temporarily reversed when a southerly breeze "banks" the water in the main stream. The part of the spit concerned is an island, as the river bifurcates at its eastern end, the main body of water following the river, the remainder flowing into the lagoon through a narrow channel and joining the river again by another channel through the spit, three kilometres to the west, on Section 278. When the river is heavily flooded, as for example in 1917, the island is almost wholly inundated. It commands a view of the whole valley in all directions for a considerable distance, and there is abundant animal life in the adjacent lagoon.

A diagrammatic section of the Murray Valley at Tartanga is given in fig. 3; the valley is here about one and one-half kilometres in width. The river is approximately 100 metres wide, and it is cutting into its left (or south-eastern) bank of Middle Caenozoic marine limestone cliff, which is vertical and about 30 metres in height. The south-eastern side of the spit constitutes the north-western bank of the main stream.

At the site under discussion the spit varies in width from 60 to 100 metres, and the flowing lagoon is eroding its low graded north-western aspect. On this side a series of strata of consolidated sand has been exposed and weathered; these deposits, most of which are as hard as baked brick, were traced for two kilometres westward. The exposures of their weathered surfaces vary in extent, but are nowhere more than a few metres in width. A contour map of the Tartangan portion of the spit was made, the form-lines utilized being those conveniently provided by flood-levels (fig. 5).

From early observations it was concluded that the consolidated deposits extended below the recent muds and silts of the "Upper Beds" which now form

Fig. 3. Diagrammatic cross-section of the Murray Valley at Tartanga, South Australia.

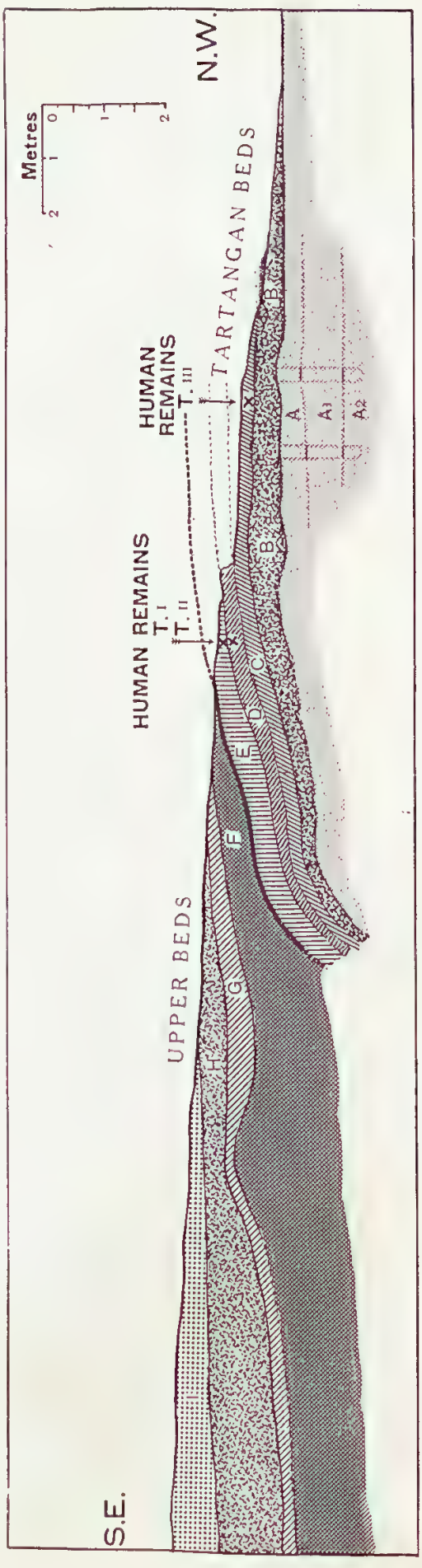

Fig. 4. Section of the Tartangan and Upper Beds at Tartanga, upon which the relative positions of the human remains have been projected. (See also fig. 5.)

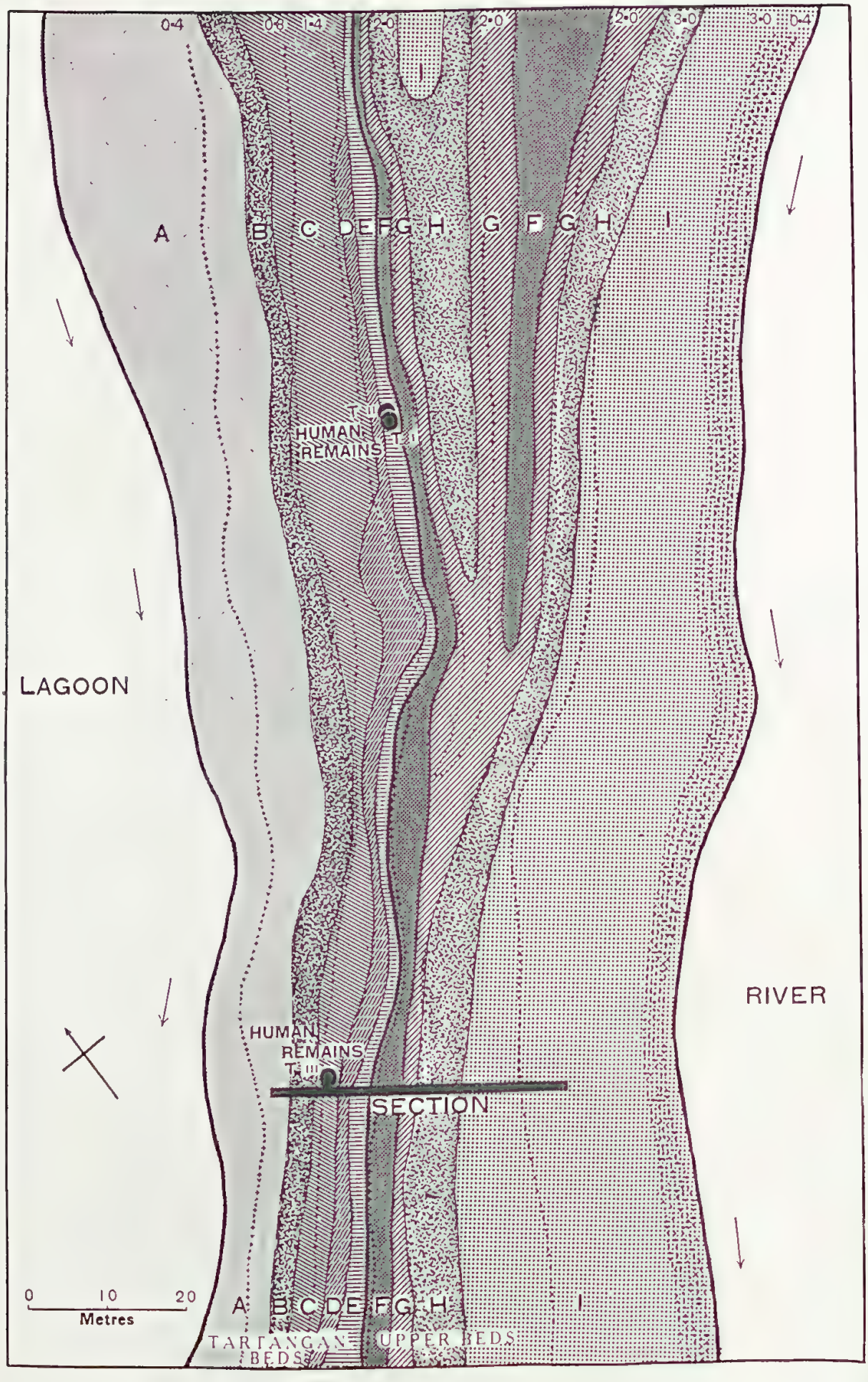

Fig. 5. Contoured plan of portion of Tartanga site, showing locations of the human skeletons recovered.

the great bulk of the island. On the second visit to the locality a trench was made across portion of the spit, in order that exact data might be secured, and the facts detailed below were established.

STRATIFICATION.

The accompanying section of the beds at Tartanga (fig. 4) was drawn to scale from measurements secured after excavation. For convenience of reference, and for labelling specimens in the field, the respective layers were tentatively called A, B, C, etc., and now, as a large number of specimens and much data thus referred to has accumulated, these designations have been retained in order to prevent confusion.

Stratum A in the sketch forms the lagoon shore, and is the lowest deposit to which we excavated, although borings suggest the presence of occupational debris, including fresh-water mussels *(Unio)* in at least two other beds below it; these two layers underlying A consist of one (A^1) of sandy blue clay, 75 cm. in thickness, and another (A^2) of red sand of unknown thickness. Stratum A is composed of soft grey to white sand, of a maximum depth of 45 cm. The three overlying strata (B, C, and D) are composed of consolidated sand and numerous limy nodules, and in parts are so indurated that in weathering they have formed abrupt terraces, or have dropped, as weathered pavements, owing to erosion of softer underlying material; their maximum depths are, B, 50 cm.; C, 30 cm.; D, 40 cm. Overlying layer D is a rather less consolidated stratum (E, about 40 cm. in thickness), composed of sand and very numerous limy nodules. These four more or less consolidated layers (B, C, D, and E) are of distinctive colourations (and impart characteristic stains to the contained fossils) a fact which was of considerable assistance in tracing the beds. Thus, B is yellow, with heavy ferruginous staining; C is bluish-grey; D exhibits ferruginous staining on the lower half of the stratum, and is yellowish-white above; E is greyish-white. Each of the weathered terraces is strewn with water-sorted limy and ferruginous nodules, characteristic of the beds from which they were derived.

The four successive and more recent deposits overlying the strata mentioned above are also well differentiated. They consist of: F, blue-black clay; G, grey clay; H, mud and sand; I, fine sand. Professor J. A. Prescott (of the Waite Agricultural Research Institution) examined samples of these "Upper Beds," and reports that they are markedly alkaline, and have pH values as follows: F, 8·0; G, 8·5; H, 8·5; I, 8·0.

The consolidated strata B to E represent successive surfaces of an old island, now mostly eroded away on its western side by the lagoon. Dr. Charles

Fenner is of the opinion that the eastern slopes of these beds represent the former successive western banks of the river, and that the latter has swung 40–50 metres to the south-east as it has cut for a similar distance into the steep and fairly resistant limestone cliff; it is obvious that the greater part of this work took place after the period when the camp-debris in these strata was laid

Fig. 6. Young cliff directly opposite Tartanga site; the cross marks the position from which fig. 7 was taken.

down. The newer "Upper Beds" (F to I) have been deposited (and have covered the eastern slopes of the older beds) as the river has cut into its concave eastern bank.

In fig. 6 portion of the young cliff opposite the section cut at Tartanga is illustrated; the spot from which the panoramic photographs reproduced in fig. 7 were taken is marked X.

In a period antecedent to the present stage of active cliff erosion opposite Tartanga, the aforementioned rock-shelter at Old Devon Downs (Section 89, Hundred of Nildottie) appeared near the western end of this concave cliff, at about its junction with the convex section which curves to the south-west (fig. 2). In this shelter a succession of human occupational debris, more recent than that of Tartangan beds A to E, was deposited over a period sufficiently long for some notable changes, described in Part III of this paper, to have taken place.

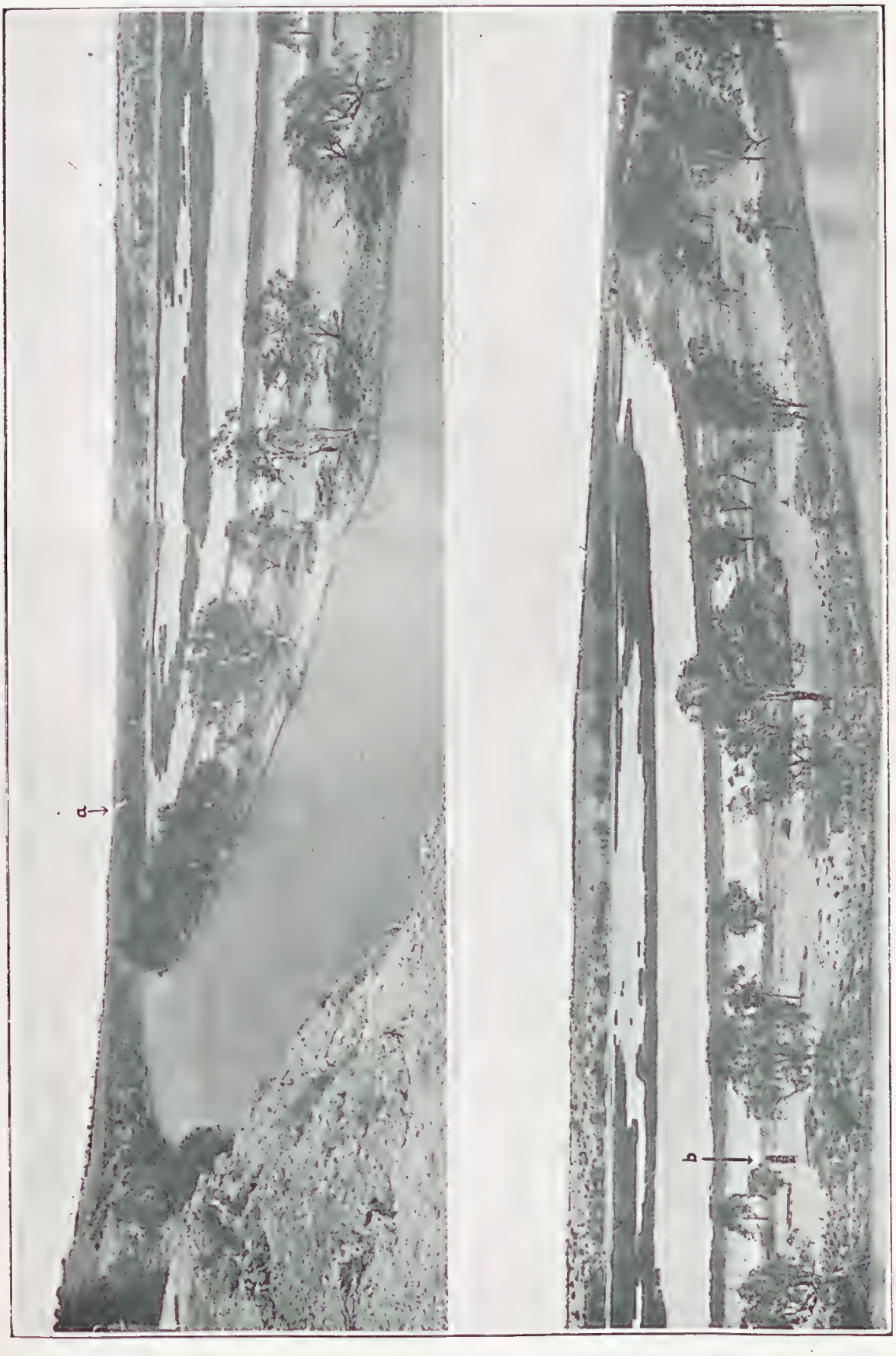

Fig. 7. Panoramic views of the Murray Valley. Upper figure looking south and west; lower figure looking west and north. a, indicates position of Devon Downs Shelter; b, site of trench and section at Tartanga.

TARTANGAN BEDS (A TO E).

For convenience of reference the term "Tartangan" is herein restricted to the period during which beds A to E were occupied and deposited. The excavations show that, with the probable exception of beds F and G, all of the above-mentioned deposits, A to I, contain evidence of aboriginal occupation, but there is a marked difference in the animal remains from series B to E as compared with those from above the very thick and almost sterile stratum F. For instance, in the earlier deposits bones are heavily stained with iron oxide (particularly those from B and the lower part of D), and have undergone considerable mineralization, while mussels have lost all trace of epidermis. In the Upper Beds, on the other hand, the majority of the mussels show at least some trace of epidermis, and bones are little changed. The fossils from strata B to E are in most cases embedded solidly in the matrix, and commonly form the nuclei of large limy nodules. This was discovered in breaking open some of the latter while excavating and, later, bones were secured in weathered nodules.

Many bones of fish and fresh-water tortoises, *Unio* shells, burnt stones, etc., lie on the various miniature beaches amongst the limy nodules and other detritus weathered from beds B to E. A large amount of such material was secured by searching and by extensive sieving. In many cases the bones have adhering to them portion of the indurated matrix, while the distinctive staining, and the positions in which the fossils were lying, often enabled one to determine the deposit from which they had been weathered. Nevertheless, all such specimens not secured *in situ* are labelled accordingly.

Structural differences of Tartangan Mussels, as compared with forms living in the locality. The most abundant *Unio* which occurs in beds A to E is a form comparable in many features with the living *U. vittatus*, but differing uniformly in having a relatively thicker shell. Typical *U. vittatus* is abundant in the adjacent lagoon, and occurs also in the Upper Beds of the island; measurements of this species from Tartanga lagoon, lagoons at Wongulla and Cockatoo Cliffs, Lake Bonney and Devon Downs (layer i), etc., have been compared with those of a long series obtained from layer C in the Tartangan beds, and the results of a comparison of the greatest thickness of the marginal shell substance in the two forms are shown in the accompanying graph (fig. 8); in this the thickness is plotted against the umbo-ventral height, showing that the mussels from Tartangan beds have consistently thicker shells than those now living. The name *Unio (Hyridella) protovittatus* sp. nov. is therefore proposed for these thick-shelled individuals (fig. 9), and layer C at Tartanga is nominated as the typical horizon (Type and paratype, reg. no. P. 178, in S. Aust. Mus.).

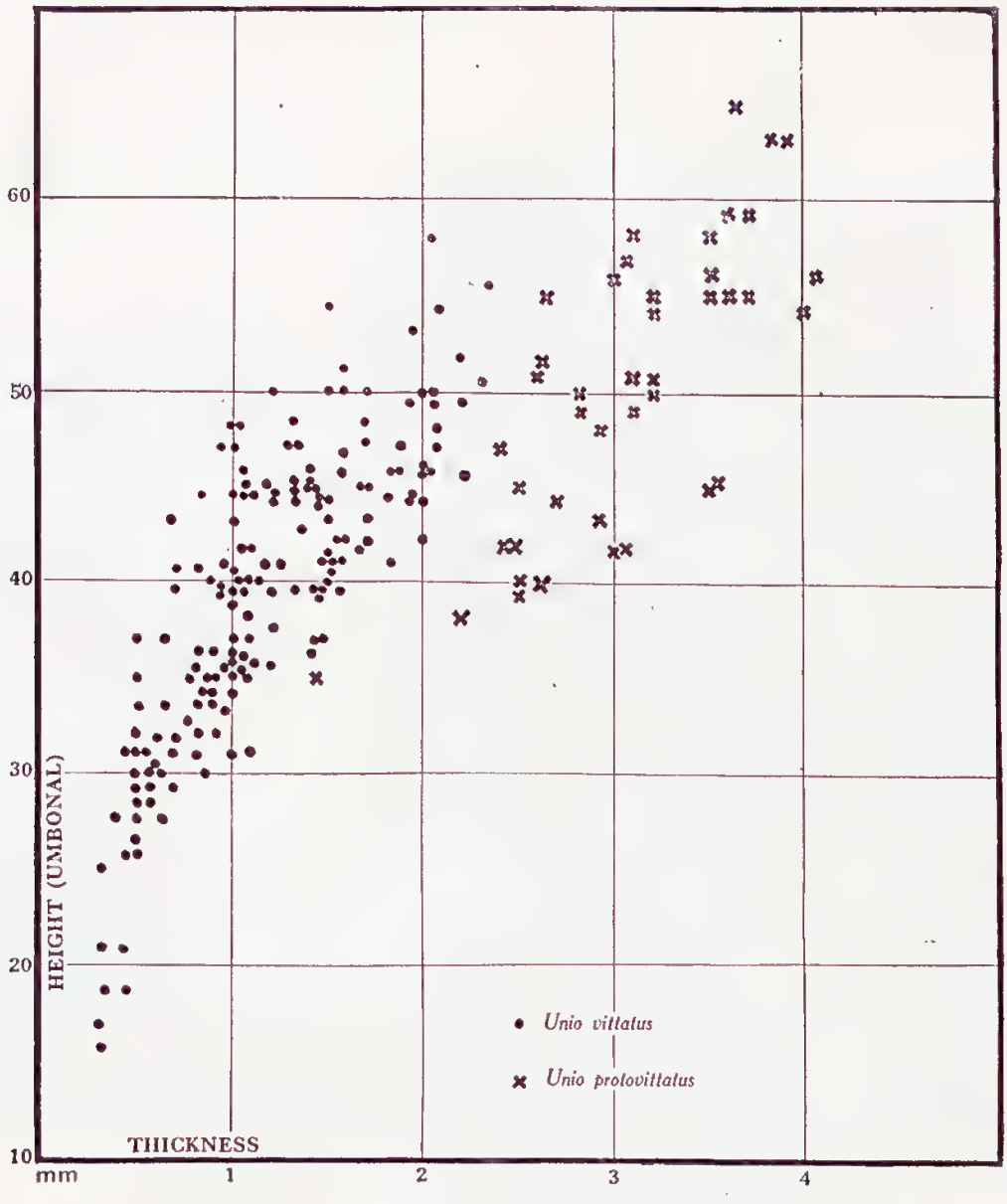

Fig. 8. Spot graph of *Unio vittatus* and *U. protovittatus.*

Another moderately common mussel in Tartangan beds is a thick-shelled *Unio,* which to-day occurs only in the deeper parts of the river, where it can be secured by dredging or diving; apparently it has not hitherto been recorded from the Lower Murray, although there are specimens in the South Australian Museum from several localities in the Upper Murray basin. It is comparable with *U. angasi* in many respects, but the latter has a much thinner shell.

Tartangan occupational evidence. The following is a detailed account of the material secured from each bed at Tartanga.

Bed A. At the place where the trench was cut the top of this sandy bed is 3 metres below the level of the present summit of the island, and 1·2 metres below the highest part of bed E. Bed A was penetrated for only a short distance

when excavating; in it are *Unio protovittatus*, and burnt stones suggestive of cooking-hearths.

Fig. 9. *Unio (Hyridella) protovittatus* sp. nov. Composite drawing of two specimens from Layer C Tartangan Beds (nat. size).

Bed B. In this consolidated bed are burnt stones, and food debris consisting in the main of *Unio protovittatus* arranged in stratified layers; vertebrae and jaws of fish (comparable with living *Oligorus*) and bones of mammals *(Macropus)* and fresh-water tortoise *(Chelodina)* also occur. The bones are in most cases stained dark umber or almost black; some of the fish and tortoise bones from the lagoon beach were evidently weathered from this deposit, as they have this characteristic stain. Several stone chippings, or flakes, together with part of one striking bone implement were recovered. The last-named is the apical portion of a split long-bone which has been trimmed and smoothed (fig. 24).

Bed C. Bands of *Unio* and burnt stones are very abundant in this layer, and in places occupy the whole depth of the bed (fig. 10). The bone fragments are stained brown or, especially in the upper part, bluish-brown. The debris includes remains of the following:

MUSSELS: *Unio protovittatus* (type form); *U.* cf. *angasi* and *U.* cf. *ambiguus.*

UNIVALVE MOLLUSC: *Paludina hanleyi.*

FISH: *Oligorus* cf. *macquariensis* (large numbers of vertebrae and jaws; also vertebrae of smaller species); *Tandanus sp.*

TORTOISES: *Emydura* cf. *macquarii* and *Chelodina* cf. *longicollis.*

BIRDS: Unidentifiable fragments of bones.

MAMMALS: *Trichosurus* cf. *vulpecula* (Opossum); *Thylogale sp.* (Wallaby), and unidentifiable fragments of bones.

HUMAN REMAINS: (Tartanga No. iii) the skeleton first noticed by Mr. Roy was in this deposit.

ARTEFACTS: A few stone implements and many chippings.

Bed D. Thick *Unio* bands and burnt stones occur at many isolated places along the exposure of this layer. The bones are stained a dark brown (lower part) and bluish-brown (upper part).

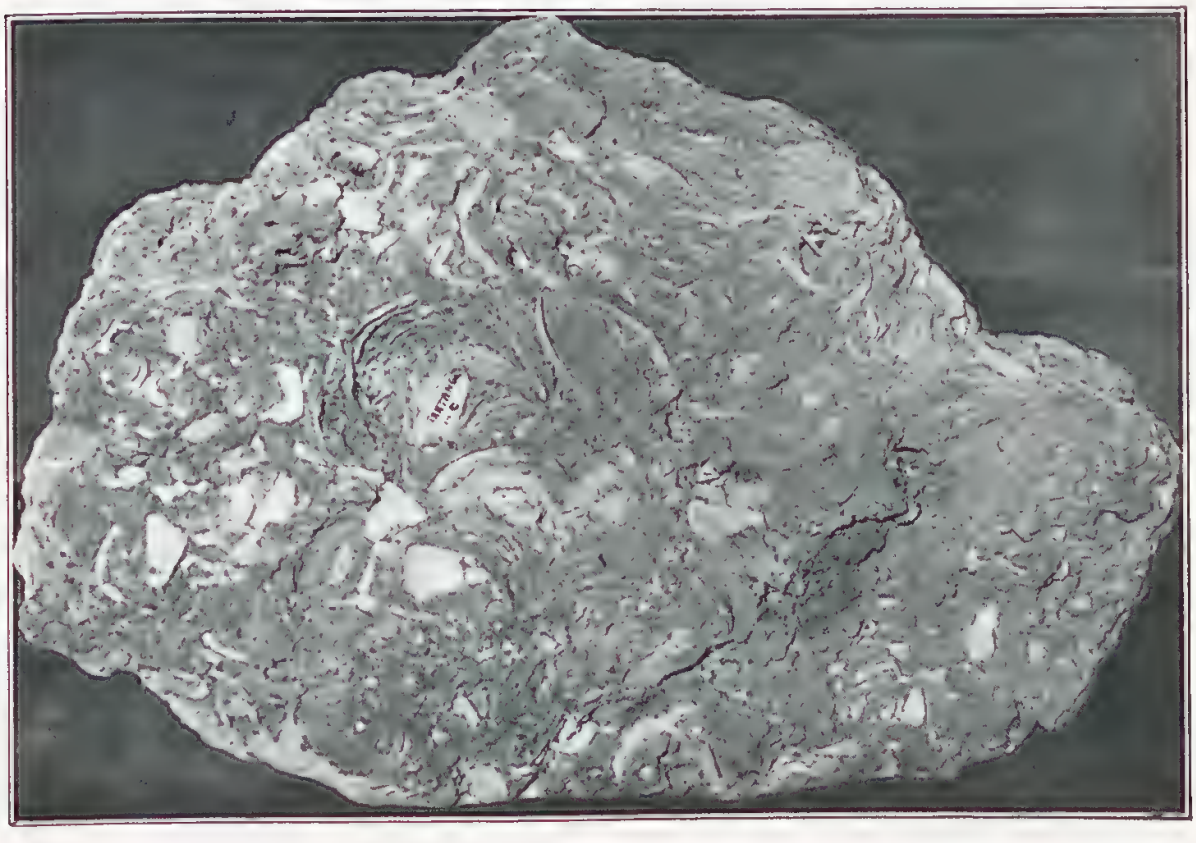

Fig. 10. Dense pavement of *Unio* shells from Layer C, Tartangan Beds (¼ nat. size).

MUSSELS: *Unio protovittatus* and *U.* cf. *angasi.*

UNIVALVE MOLLUSC: *Paludina hanleyi.*

FISH: *Oligorus* cf. *macquariensis.*

TORTOISES: *Emydura* cf. *macquarii* and *Chelodina* cf. *longicollis.*

MAMMALS: Similar unidentifiable material to that secured in bed C, with the addition of fragments of jaws and other bones of several large kangaroos, which Mr. H. H. Finlayson determines as *Macropus* cf. *giganteus* (p. 211).

HUMAN REMAINS: (Tartanga No. ii); portion of a maxilla, and three disassociated teeth, were disinterred from the uppermost level of this bed, directly beneath the site of a burial in layer E, mentioned below, while lying just above it was the right ramus of a lower jaw.

ARTEFACTS: Chippings and implements, chiefly of white quartz and white

chert, were present. In addition two large nether mill-stones and several smaller pounding and grinding stones were secured *in situ*. Other pounding stones, weathered out, were found lying loose on eroded areas of D.

Bed E. Bands of *Unio* shell and burnt stones continue in this bed. Bones in the lower levels are stained light brown, while those from upper limits are lighter coloured, in some cases with irregular dark staining.

MUSSELS: *Unio protovittatus* and *U.* cf. *angasi* (shell much broken and specimens suitable for identification rare).

UNIVALVE MOLLUSCS: *Paludina hanleyi* and *Bulinus pectorosus.*

FISH: *Oligorus* cf. *macquariensis* (very large vertebrae, etc.).

TORTOISE: *Emydura* cf. *macquarii.*

HUMAN REMAINS: (Tartanga No. i); an undisturbed but much fragmented skeleton was found in the lowest level of the deposit, embedded in a matrix of sand-rock containing debris typical of the layer.

ARTEFACTS: Intimately associated with the skull of the skeleton just mentioned were portions of four or more bone implements; one of these fragments was lodged near the mouth region of the skull. A few crude chert and quartz chippings were found in and on E.

UPPER BEDS (F to I).

Bed F. This is of relatively great thickness, and is composed of blue-black clay; the nature of the surface of such material would perhaps discourage its use as a camping ground, and the only evidence of native occupation so far recovered in it is a crude millstone. This was found during the excavation of the section, at a depth of 80 cm.

Bed G. Is formed of grey clay and is almost entirely barren. A single flake of irregular white quartz, exhibiting what may be poor attempts at secondary chipping, was secured during the cutting of the section.

Bed H. In this level, which is composed of sandy clay, there are numerous signs of intensive occupation in the form of *Unio* hearths, ash, etc., in places forming thick stratified layers.

By sieving six cubic metres from the upper parts of the bed we obtained a long series of the thin-shelled *Unio rittatus*, resembling living examples and quite distinct from the thick-shelled *U. protovittatus.* The epidermis still remained on some, but on exposure to air this frequently peeled off. A single shell of *Unio angasi* (thin type) and a few fragments of tortoise bone were also found; the bones are not mineralized.

"High-backed" chert implements and hammer-stones collected from the surface of this and the preceding bed are possibly weathered from one or the

other of them. The high-backed artefacts are worn discoidal scrapers of the type called "*tula*" by living natives of the Wonkanguru tribe of the Lake Eyre district in northern South Australia.

Bed I. The surface of this sandy level now forms the top of the island and the river bank. It is strewn with broken mussel shell and other signs of recent aboriginal occupation. A few handmills were secured, but no definite stone artefacts; as usual on modern Murray sites there were relatively few stone chippings.

HUMAN REMAINS.

Tartanga No. i. The broken right parietal of this individual was protruding from the weathered surface of the bottom of bed E, at a point 80 metres east of the cut section (figs. 4–5). When the matrix was cleared it became evident that the body had been buried from an upper level of this bed and had been placed in a shallow grave; the surface surrounding the exposed part of the skull was comparatively soft owing to weathering, but the matrix in which the bones were solidly embedded was homogeneous below with the rest of the lower part of the bed. The skeleton was lying at full length on the back with the head to the north-east. The right arm was sharply flexed, with the clenched hand in front of, and 10 cm. from, the face; the left arm was lying alongside the body, with fragments of the finger bones in the pelvic region.

Owing to weathering the face of the bed was here irregular and sloping, so that the limbs and thorax were approximately 30 cm. below the surface. The skull had been displaced to one side and, like the other bones, had partly decomposed and become greatly fractured before consolidation of the matrix occurred, as is evidenced by the fact that the spaces between broken and slightly disassociated fragments were filled with a hard limy cement. The major part of the cranium and facial skeleton, the right hand and arm, fragments of the left arm, portions of some ribs, most of the pelvis, and fragments of vertebrae and leg bones, were recovered. The lower jaw was missing.

Owing to the fractured condition of the skull, a block of the consolidated material enclosing it was embedded in paraffin wax and brought to the Museum for development. The removal of the fragments from the sand-rock occupied much time. The brain-cavity was found to be filled with fine sand, consolidated with a limy cement which, where in contact with the bones, formed a hard layer 1 cm. in thickness, from which it was difficult to separate the skull fragments.

The following measurements are some of those recommended by Martin (1928, ii, p. 625 *et seq.*) and his reference numbers are shown in the first column of the table. Owing to the absence of the left temporal, the left malar, the lateral parts of the parietals and the basal portions of the occipital many of

the conventional measurements cannot be secured, and others (where only one side is preserved) can be only estimated. Where estimations have been necessary in order to provide an approximate measurement, the result is marked with an asterisk.

Martin's Nos.	Tartanga I.
1. Greatest skull length [g–op]	189
2. Glabello-inion length [g–i]	181
3. Glabello-lambda length [g–l]	187
8. Greatest skull breath [eu–eu]	135
9. Smallest frontal breadth [ft–ft]	103
10. Greatest frontal breadth [co–co]	117*
11. Bi-auricular breadth [au–au]	128*
12. Greatest occipital breadth [ast–ast]	107*
13. Mastoid breadth [ms–ms]	106*
20. Ear-bregma height [po–b]	114
26. Median sagittal frontal arc [n–b]	129
27. Median sagittal parietal arc [b–l]	133
28 (1). Median sagittal supra-occipital arc [l–i]	62
29. Median sagittal frontal chord [n–b]	115
30. Median sagittal parietal chord [b–l]	118
31 (1). Median sagittal supra-occipital chord [l–i]	60
44. Bi-orbital breadth [ek–ek]	102*
45. Bi-zygomatic breadth [zy–zy]	130*
46. Middle facial breadth [zm–zm]	81
48. Upper facial height [n–pr]	55
50. Anterior inter-orbital breadth [mf–mf]	24*
51. Orbital breadth from maxillo-frontal suture [mf–ek]	41 right
52. Orbital height	30 right
54. Nasal breadth	25
55. Nasal height [n–ns]	43*
57. Smallest breadth of nasal bone	13*
57 (1). Greatest breadth of nasal bone	20*
60. Maxilla alveolar length	62*
61. Maxilla alveolar breadth	67
62. Palatal length [ol–st]	52*
63. Palatal breadth	39
72. Profile angle [n–ns]	10°*
73. Nasal profile angle [n–ns]	6°*
74 Alveolar profile angle [ns–pr]	18°*
Area of palate	3600*

INDICES.

Martin's Nos.	Tartanga I.
Length breadth index	72
Length-auricular height index	60
Transverse frontal index	88
Transverse fronto-parietal index	76
Sagittal fronto-parietal index	103
Sagittal frontal index	89
Sagittal parietal index	89
Convexity index of supra-occipital	97
Upper face index	42
Orbital index	73
Nasal index	58
Maxillo-alveolar index	108
Palatal index	75

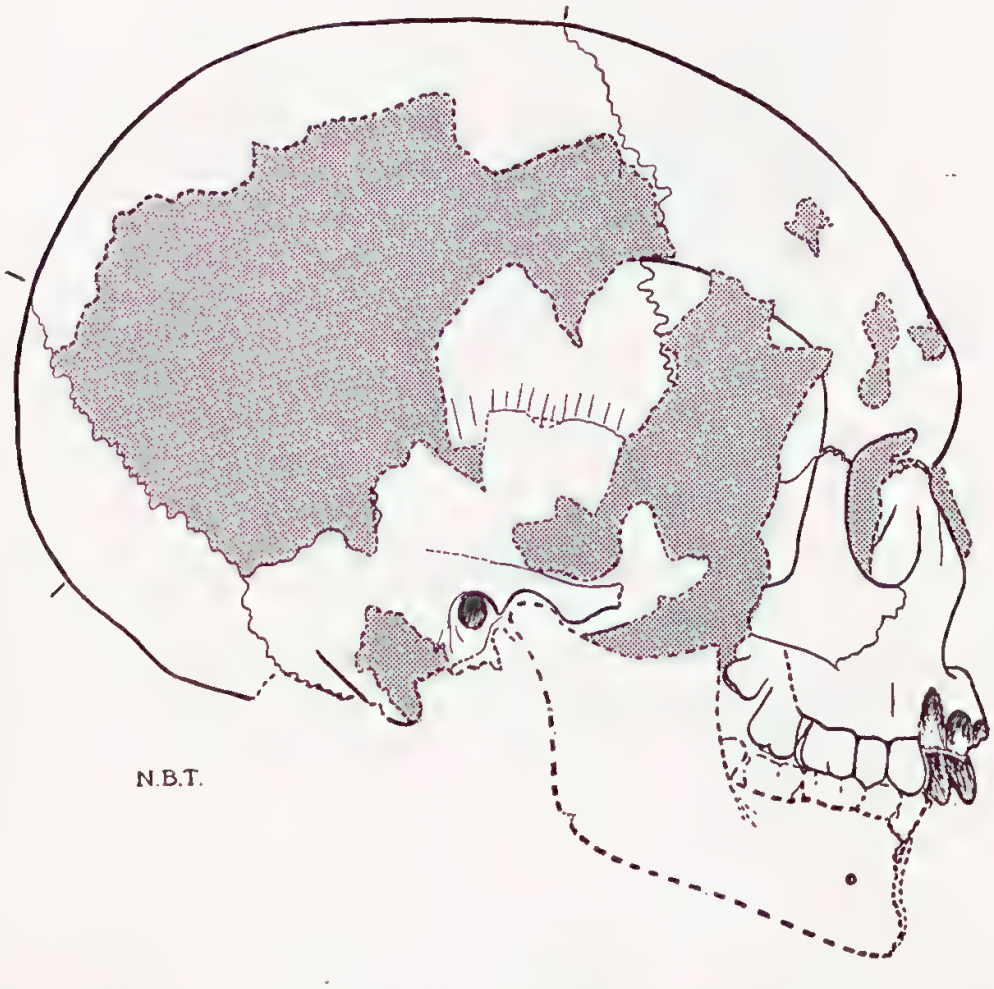

Fig. 11. Skull of Tartanga i from Layer E, Tartangan Beds, *norma lateralis* on Frankfort Horizontal; lower jaw of Tartanga ii indicated in dotted outline (½ nat. size).

The accompanying illustrations (figs. 11–15) have been drawn with the aid of the dioptograph of Lucae. Because of its greater completeness it has been considered more satisfactory to illustrate the right lateral aspect than the left. The principal vacuities in the cranium are shown; superficial surface injuries and fracture lines have been omitted.

Dentition (T. D. Campbell). Tartanga i has the upper jaw region well preserved, but the mandible is absent. Missing fragments and some distortion of one side of the upper jaw make it difficult to obtain accurate measurements of the palato-alveolar features, but as many as possible have been made and are incorporated in the general table.

Fig. 12. Tartanga i, *norma frontalis* on F.H. (½ nat. size).

The upper teeth of the left side, with the exception of the central incisor are present; the third molar was *in situ*, but had not descended into its place in the arch. On the right side only the molars and premolars are present; on this side also the third molar had not erupted. The teeth are large and well formed, and all but the unerupted third molars are above the average measurements recorded for individual teeth of Australian aborigines. The second incisor is equal to the maximum recorded.

The development of the teeth suggests that the age of this individual was from ten to twelve years. Attrition has only moderately reduced the cusp levels (stage i, Broca); somewhat less than might be expected in a native of this age.

Tartanga No. ii. As previously mentioned portion of a left maxilla, the right ramus of a lower jaw, and three loose teeth (two molars and a premolar) of a youthful individual were disinterred from the top of bed D immediately underneath the position of the skull of Tartanga No. i (figs. 16–18).

Fig. 13. Tartanga i, *norma verticalis* on F.H. (½ nat. size).

The maxilla, together with fragments of *Unio protovittatus* was embedded in a hard concretionary nodule. The removal of the surrounding sand-rock to the depth of a few centimetres did not bring to light any further remains; further excavation in the consolidated material of D will be necessary before it can be determined whether other portions occur *in situ*. The facies is typical of bones from bed D; the maxilla is stained dark brown, and the teeth are orange to dark brown.

In an attempt to learn the degree of mineralization of these remains the weight of the portion of the ramus of the lower jaw was compared with that of five similarly shaped part jaws of recent aborigines and the ratio of increase in weight was found to be 1·0 : 1·5.

Dentition (by T. D. Campbell). The dental specimens of Tartanga No. ii include portion of the left maxilla, much of which is still enclosed in the matrix. With the exceptions of the central incisor and third molar all the

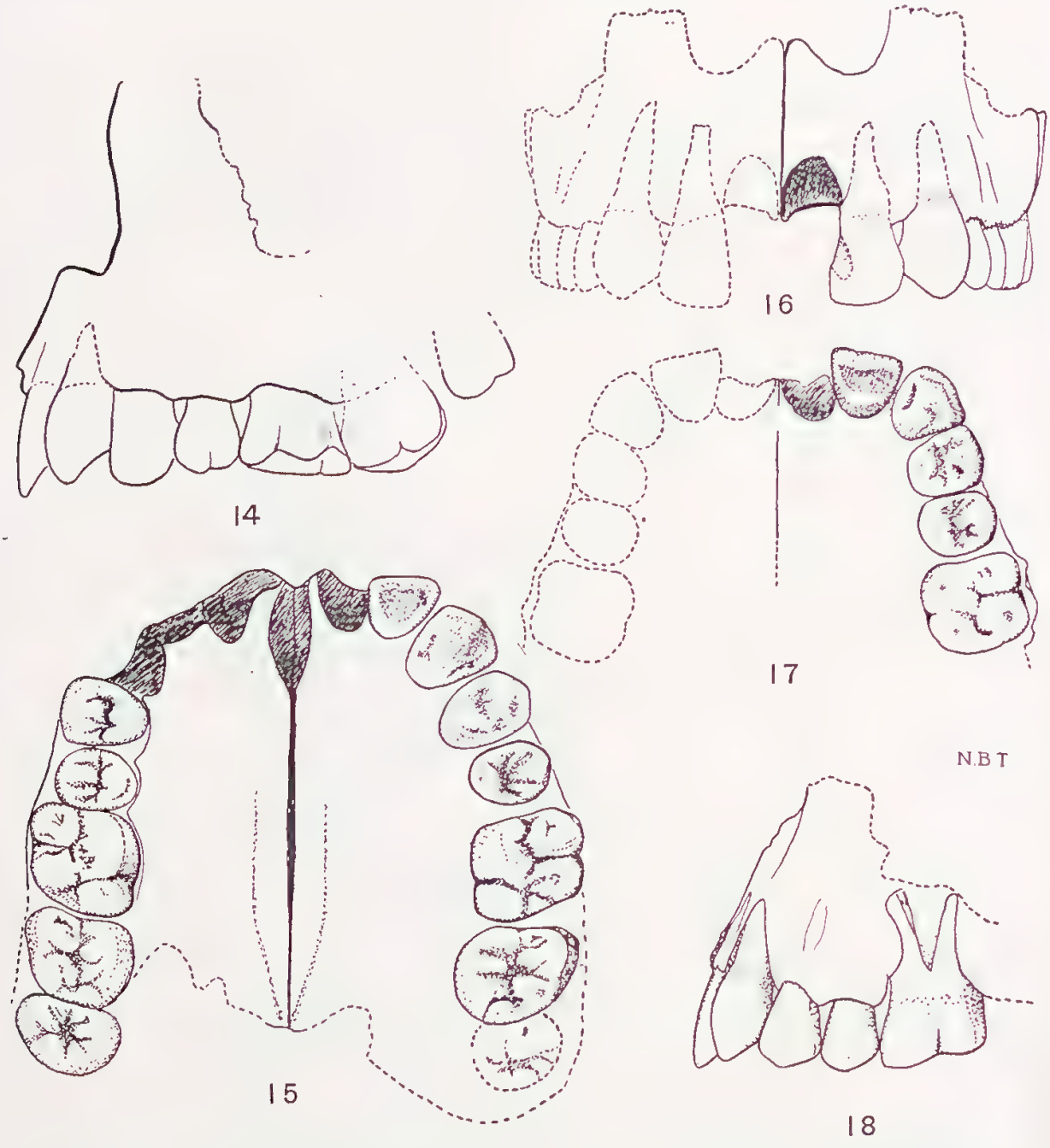

Fig. 14-15. Palate and maxilla of Tartanga i, Layer E, Tartangan Beds (nat. size).

Fig. 16-18. Fragment of maxilla of Tartanga ii, Layer D, Tartangan Beds (nat. size.)

teeth of the left side are present; the second molar was free when unearthed, and its place was occupied by matrix. A right upper third molar and the right portion of a mandible found nearby apparently also belong to the same individual. The lower jaw fragment is complete up to the first premolar, and all

Fig. 19. Skeleton of Tartanga iii, in sandrock, as removed from Layer C, Tartangan Beds (⅓ nat. size).

the teeth of the molar-premolar series are present; the socket of the first premolar contained the extremity of the root and was otherwise filled with matrix, while the rest of the tooth was found separately.

The condition of the teeth indicates an age of about twelve years. Attrition has almost obliterated the cusps of the first molar teeth, but the remainder are only slightly worn. The teeth are all large and well formed; there is a more marked crenation of the occlusal surface of the second and third molars than is usual in teeth of Australian aborigines.

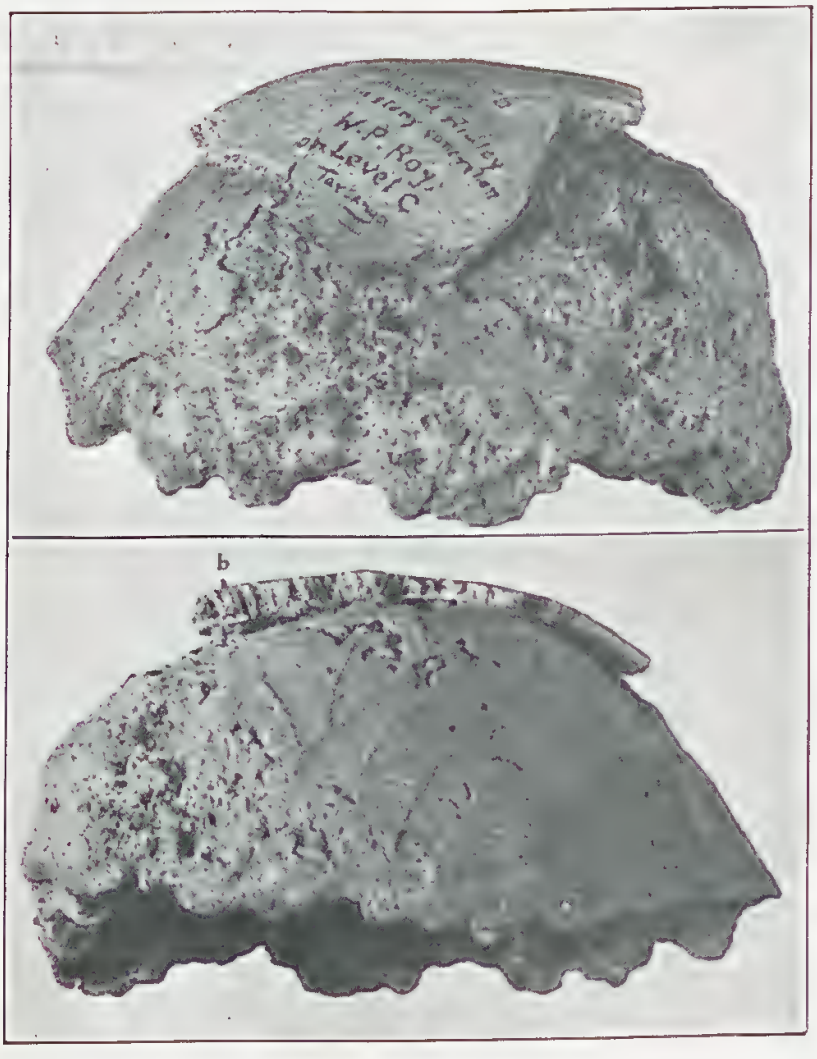

Fig. 20. Skull fragment of Tartanga iii, with stony endocranial cast; *norma lateralis*, right (top), left (bottom); b indicates *bregma*. Layer C, Tartangan Beds (½ ant. size).

Tartanga No. iii. These remains consist of the portion of calvarium discovered by Mr. Roy and the part skeleton subsequently removed from bed C, one metre east of the prepared section.

The stratification of densely packed *Unio* debris in the vicinity of this burial was well marked, and the cutting of a small section showed distinctly where

the excavators of the grave had disturbed the arrangement of the shell layers, leaving a record of their excavation of a grave little wider than was necessary to accommodate the body. The disturbed shell debris, sand, and ash was thrown back, and now, in a consolidated condition, surrounds the remains of the skeleton. The bones are stained similarly to others from the lower levels of bed C. The skeleton, which is being preserved in its matrix (fig. 19) is that of a youthful individual, and comprises the greater part of the trunk with the pelvis and proximal portions of the femora. Nodules partly embracing other bone fragments presumably belonging to this skeleton were secured by sieving debris on an adjacent terrace.

The body was buried from, apparently, the upper part of bed C, and was interred in an extended position with the head pointing to the south-west and the extremities to the north-east. As in Tartanga i, one arm (in this case the left) was flexed, with the hand resting just below the left shoulder, while the other arm was extended alongside the body, with the wrist on the right hip and the palm of the hand on the pubic region.

The skull fragment formerly associated with this skeleton consists of an irregular portion of the right parietal and a small part of the left parietal. This is adhering to a stony matrix, 1 to 2 cm. in thickness, which provides a partial endocranial cast of the greater part of the parietal region; before erosion there was evidently, as in Tartanga i, a soft core inside the harder material lining the skull cavity.

TARTANGAN ARTEFACTS.

As already mentioned, the term "Tartangan" is applied herein to material from beds A to E. No implements were found *in situ* in bed A; a few of the many white quartz and other chippings lying on the lagoon shore may have weathered from it.

Bed B. Two well-chipped, core-like implements from this level are shown in figs. 21-22; the material of one is dark yellowish chert, and of the other white chert. A well-shaped, high-backed implement of white chert (fig. 23) was lying on weathered B.

The apical portion of a single bone implement, fashioned from a piece of a split long bone of a mammal, belongs to this level (fig. 24). This is of the dark umber colour characteristic of bones from bed B, and has been shaped with bold cuts, but is crudely finished; it is illustrated with portion of the concretionary deposit attached.

Bed C. Crude high-backed implements of white chert exhibiting marked secondary working (figs. 25-27) are quite characteristic of this bed; in addition

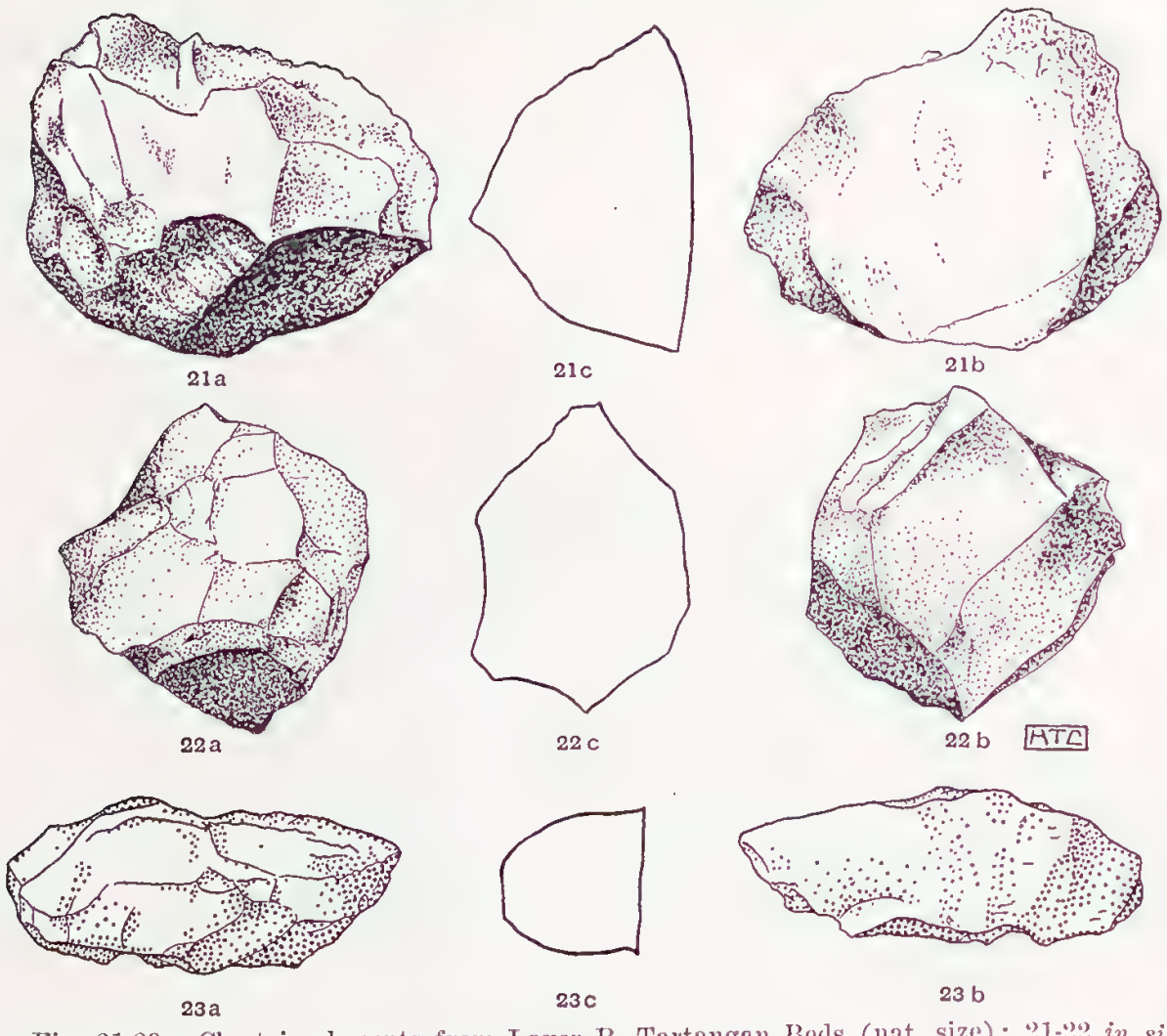

Fig. 21-23. Chert implements from Layer B, Tartangan Beds (nat. size); 21-22 *in situ*, 23 weathered out.

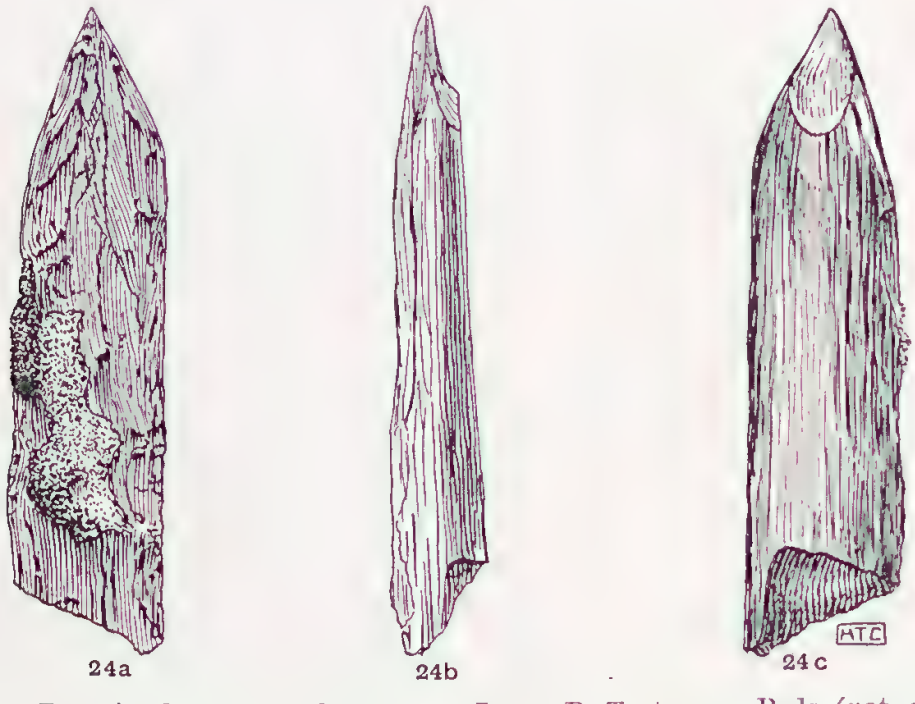

Fig. 24. Bone implement weathered from Layer B, Tartangan Beds (nat. size).

to those figured, numbers were obtained *in situ* and others were found loose on its weathered surfaces. All examples exhibit erosion or limy patination. Discoidal scrapers of the same material (fig. 28) may represent less used examples of similar type. Two larger core-like cherts, bearing indications of

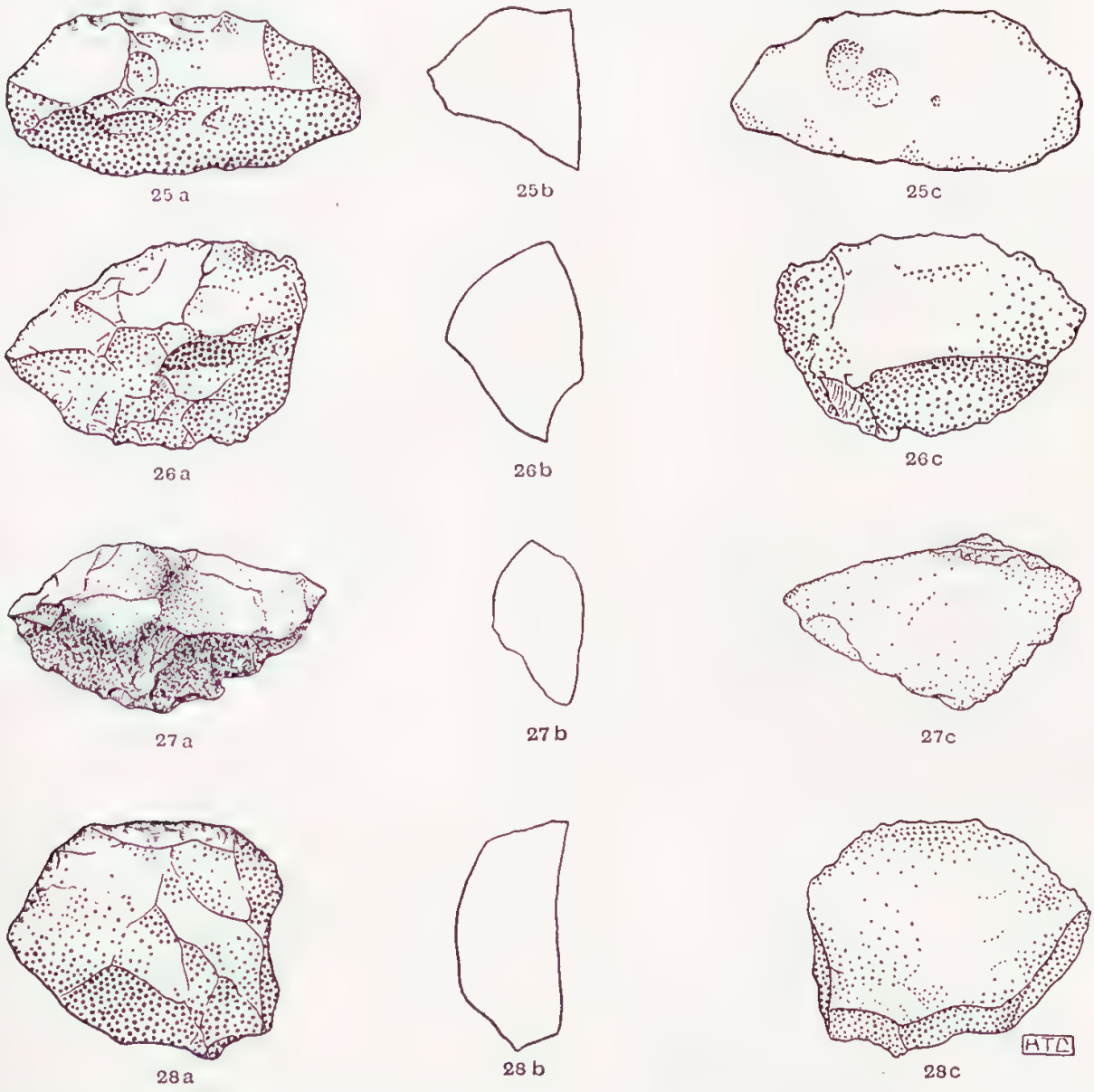

Fig. 25-28. Whitish chert implements from Layer C, Tartangan Beds; 25-27 *in situ*, 28 weathered out (nat. size).

secondary chipping, were found, that illustrated in fig. 29 *in situ* and that shown in fig. 30 on a weathered face. Much-used hammer-stones of quartzite, rose-quartz and white-quartz, and a tabular piece of phyllitic material (foreign to the locality) were taken from the bed.

Many amorphous flakes of quartz and white chert occurred in and on the bed; some have retouch chipping.

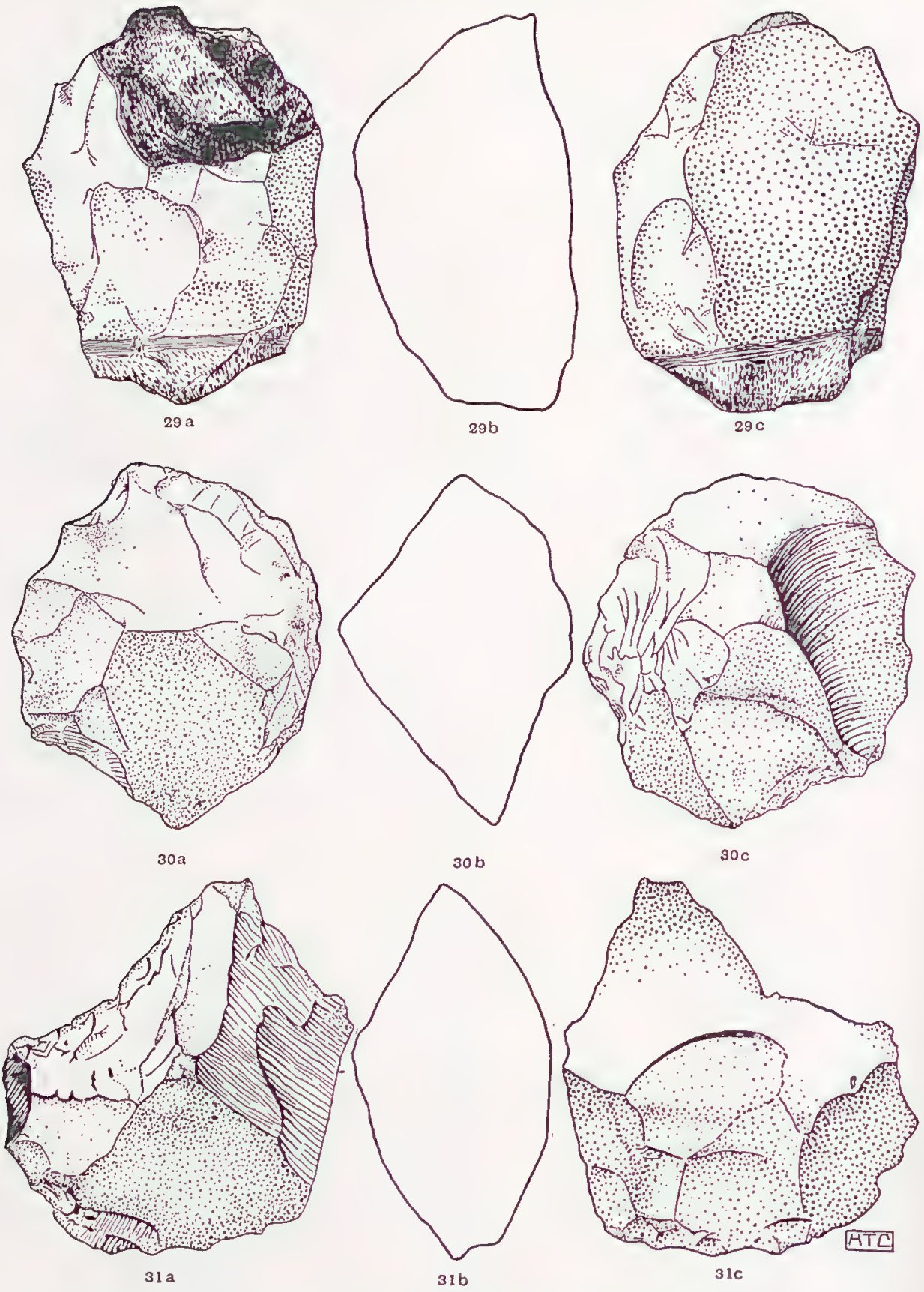

Fig. 29-31. Whitish chert implements from Layers C and D, Tartangan Beds; 29 banded and stained, found in C; 30 on weathered C; 31 *in situ* in D (nat. size).

Bed D. Implements taken *in situ* include a large white chert scraper (fig. 31) with retouch notches, one convex and one concave edge; this is perhaps the remnant of a much-used oval or discoidal scraper; also two hammer-stones (one of sandstone and the other of what appears to be siliceous limestone), and two large waterworn pebbles of sandstone, which have been used as lower millstones. In the bed and also on weathered surfaces were amorphous flakes of white and grey chert, and of white quartz, without secondary work.

Bed E. In this deposit were a small high-backed implement of grey chert (apparently burnt) and a crude discoidal scraper of white quartz, while a striking white chert tool was found on a weathered face, adhering to a mass of the deposit (fig. 32); this is of "parrot-beak" type and has much secondary work.

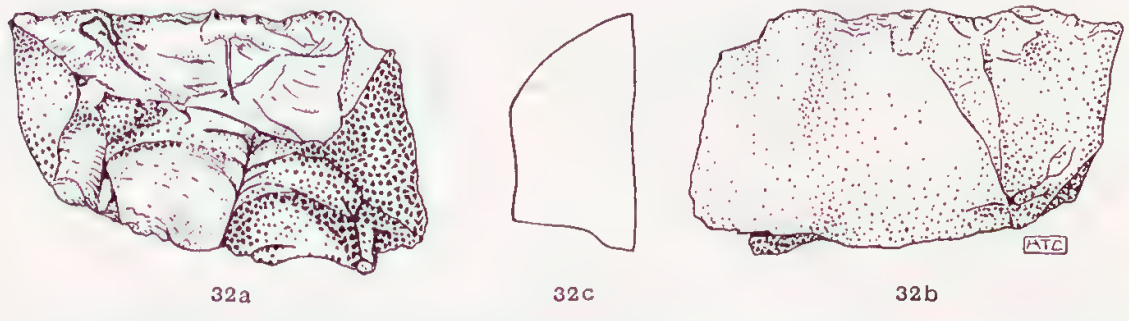

Fig. 32. White chert implement weathered from Layer E, Tartangan Beds (nat. size).

As already indicated, portions of five bone implements were associated with the skeleton of Tartanga i. Three of these are of the same type, namely, split-bone points; in one the apical part is intact (fig. 33), and shows that the bone has been scraped to a point and the latter polished. It was lying in front of the face of the skeleton, at the extreme bottom of the bed. Near it was a shorter example, the point and side of which were broken during excavation; otherwise the specimen is intact, and its base exhibits a deeply cut, acute notch (fig. 34). The third fragment was lying in the roof of the palate; were comparison with the two associated points not possible it would scarcely be recognizable as part of an implement, save for the fact that scraping marks are apparent (fig. 35).

When the block of matrix containing the skull of Tartanga i was lifted, two portions of a long, slender, pointed "round-bone" implement (fig. 36) were found lying on the uppermost level of bed D; the impression of one part is still retained in a piece of the matrix formerly covering the outer face of the left parietal. This implement has been scraped to a point, the dressing being on one side only, so that the marrow cavity is exposed some distance below the

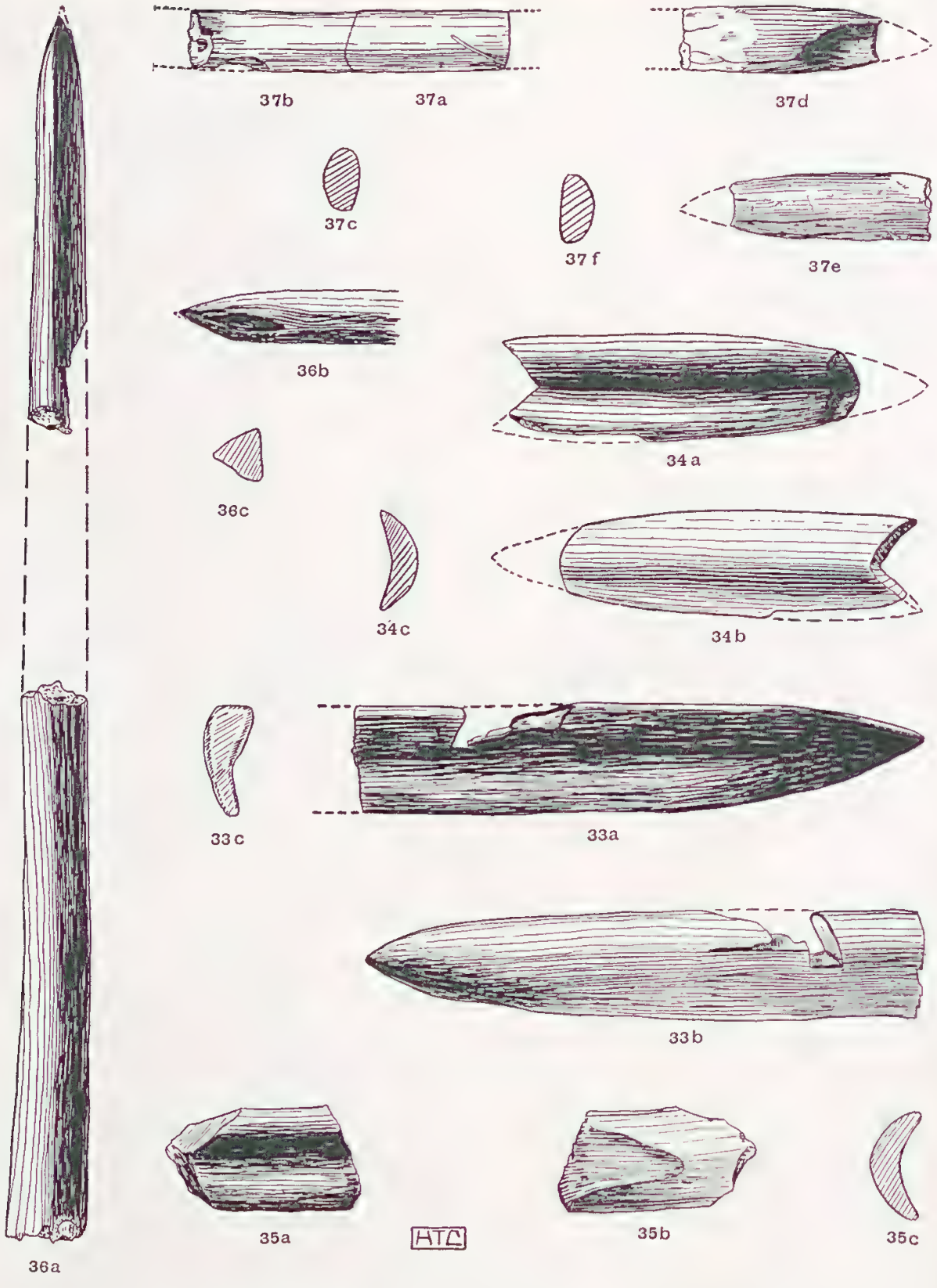

Fig. 33-37. Bone implements from Layer E, Tartangan Beds, all *in situ* (nat. size).

point (fig. 36, b). A small fragment of what is presumably a long point of similar type was adhering to the inside face (uppermost when found) of the right ramus of the mandible of Tartanga ii (fig. 37, a), and a further portion

(fig. 37, b), showing signs of an ancient break, was found in the sieve, and is now united to the fragment first found; what may be the extremity of this artefact was removed from a nodule present nearby (fig. 37, d-f).

UPPER BEDS ARTEFACTS.

Bed F. The aforementioned mill-stone was the only native handiwork located. According to Mr. A. R. Alderman this is a piece of an altered basic igneous rock, probably a lamprophyre. A similar rock occurs as a basic dyke in the Mannum Granite (forty kilometres to the south-west) and elsewhere in the Pre-Cambrian series.

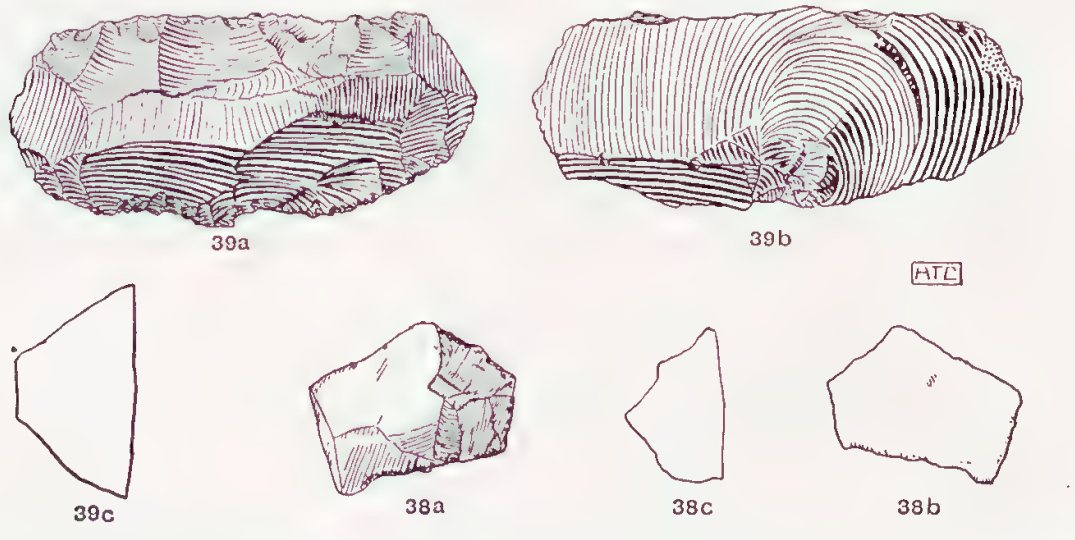

Fig. 38-39. Stone implements from Upper Beds, Tartanga; 38, quartz, *in situ;* 39, ruby chert, on surface (nat. size).

Beds G to I. An amorphous white quartz chipping, exhibiting what seems to be retouch (fig. 38), was excavated from a depth of 30 cm. in bed G. No implements were found in either of beds H and I, although simple flakes occurred on the surface. On the surface of G and H were two elongate scrapers (or worn *tula*), one of yellow chert, the other (fig. 39) of dark ruby coloured chert; both show marked secondary work, but neither is eroded or patinated as are implements from Tartangan beds.

III. DEVON DOWNS SHELTER.

LOCALITY.

The Devon Downs cliff-shelter is on the north-eastern boundary of Section 89, Hundred of Nildottie (figs. 2 and 7); the now abandoned old Devon Downs Station, from which it has received its name, is situated on the opposite bank of the river.

The shelter was described and figured by Sheard (1927). It faces due north (not west, as stated in Sheard's description), and is partly the result of aerial erosion of soft strata of the limestone cliff, which at this point is about 30 metres in height.

The occupational detritus is highest against the wall of the shelter, where it is 7 metres above water level (low river, November 22, 1929). The talus extends outward from the shelter with increasing slope to the river margin 25 metres distant (see fig. 40).

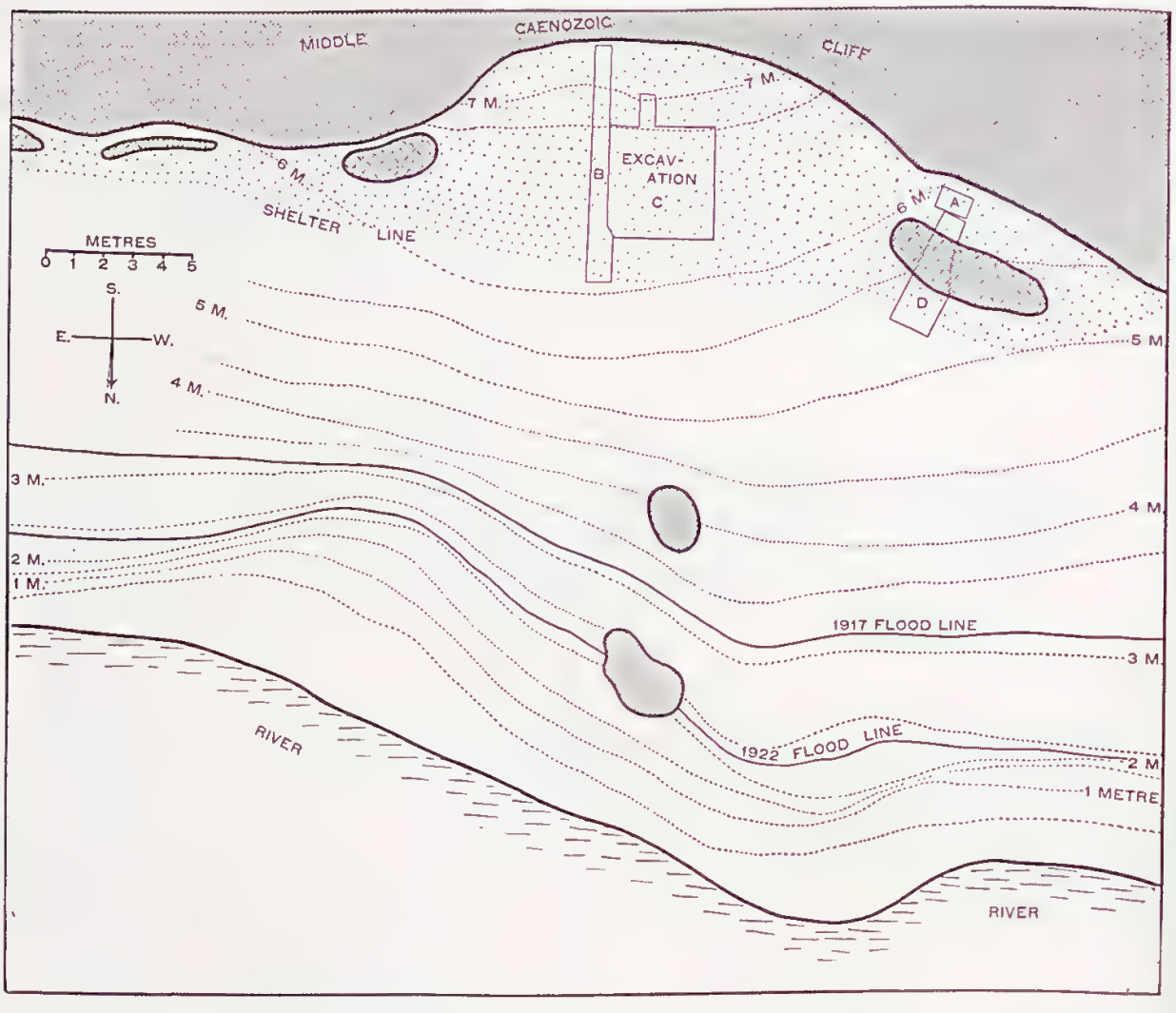

Fig 40. Contoured plan of Devon Downs Shelter and its talus, May, 1929 (A, Sheard's excavation, 1927; B-D, South Australian Museum excavations, 1929).

At the western end of the shelter a large rock projects above the surface of the stratified debris. This block has fallen away from the rock forming the present roof and back. Sheard made a small excavation (fig. 40, at A) between this rock and the wall, and states that "The floor to a depth of 3 feet is composed of old fires and a small amount of detritus. . . . . One crude upper mill-

stone and a few rough flakes were observed, these being the only native implements discovered."

METHODS OF EXCAVATION.

During our preliminary excavation of a narrow trench (fig. 40, at B) to a depth of 5 metres in May, 1929, the material was removed in horizontal layers 10 cm. in thickness, the area being divided into rectangles the width of the trench (50 cm.) and 1 metre in length. An analysis of the results, and the preparation of plans, indicated that the stratified material could be conveniently divided into series of broader bands, well defined owing to differences in appearance and constitution (fig. 41).

In carrying out the second and larger excavation, in November and December, 1929 (fig. 40, at C), the debris was removed in twelve successive layers (conforming strictly to the stratifications previously noted) to a depth of 6·2 metres. This brought to light four superimposed cultural phases, here termed, in descending order, Murundian, Mudukian, Pirrian, and Pre-pirrian (see p. 203).

Within the shelter the surface of the talus was covered with a layer of disturbed and unstratified loose sand and ash, varying from 10 to 30 cm. in depth. This material was removed over a large area before digging operations were commenced.

Small miners' picks, a shovel, trowels, bellows, and brushes were used in the removal of the material. The ashy debris was lifted in buckets, and at the lower levels it was necessary to employ block and tackle. Excavated material was placed on a large mat, and after preliminary examination was passed through sieves with a mesh of not more than 4 mm.

The proportion of occupational material, as apart from the ash, was surprisingly large, often more than one-fourth being retained by the sieves. At all levels the bulk of residue was made up of broken shell, but many hundreds of fragments of bone occurred in each; in the lists the only animals enumerated are those of which easily recognizable remains are available, such as jaws, teeth, part skulls, vertebrae, statoliths of fish, etc.

Gastroliths of fresh-water crayfishes *(Parachaeraps bicarinatus* and *Astacopsis serratus)* are abundant in the upper levels, and the tips of chelae of these crustaceans are also present. The gastroliths are indicative of but a proportion of the crayfish consumed, for these "stomach-stones" are present only at periods of ecdysis.

Records were kept of the total numbers of small Molluscs incidentally

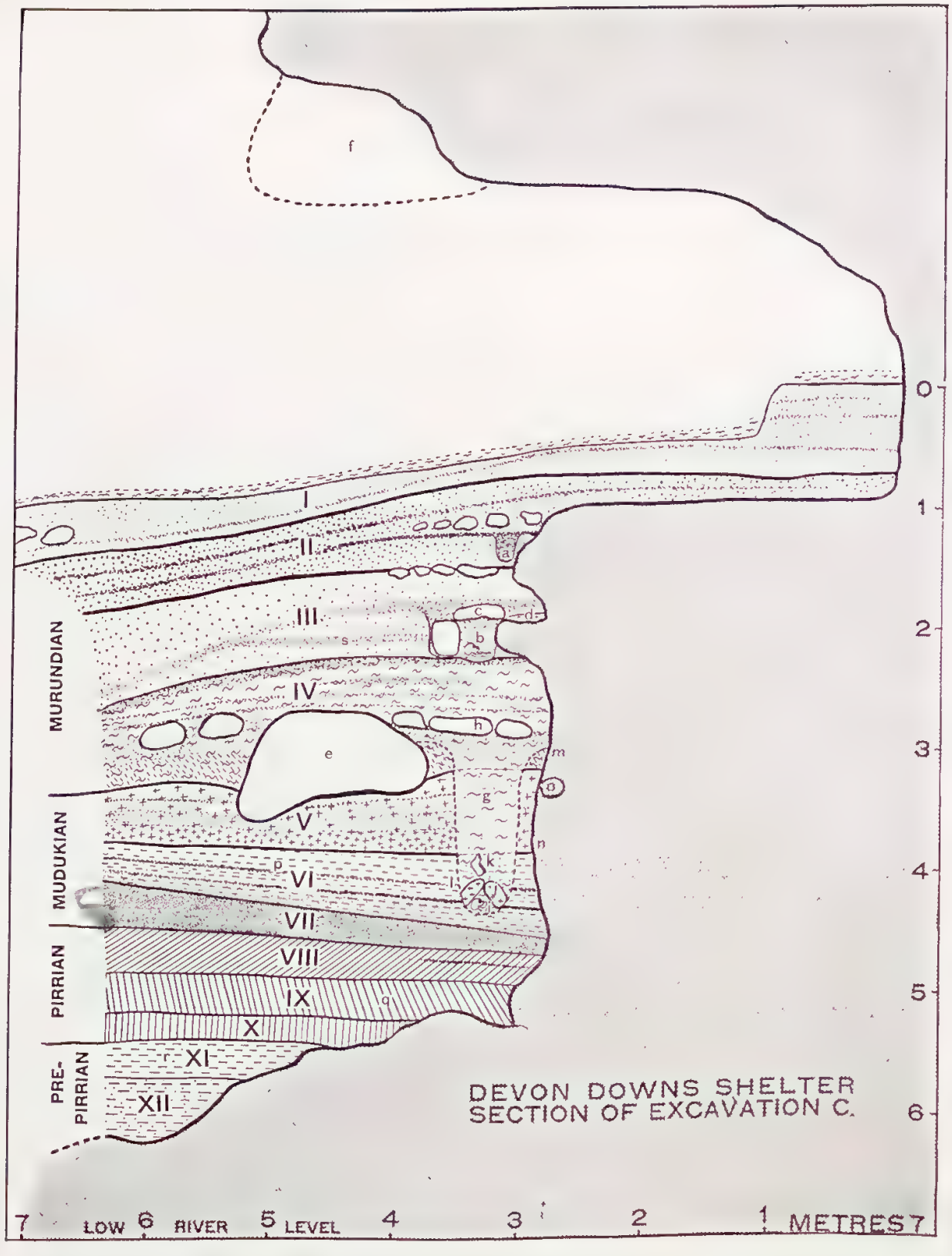

Fig. 41. Section of the deposits in Devon Downs Shelter. (a) Infant burial from the 120 cm. dark band; (b) child burial from the middle iii land surface; (c) block of limestone used as a mill-stone and inverted to form a grave capping; (d) pocket of debris, an outlier of Layers V-VII; (e) big rock which fell on top of Layer V; (f) its former position on roof of shelter; (g) grave excavated from the brown layer of IV; (h) stones capping the grave; (i) broken skull and bones of the child buried from the brown level; (j) consolidated blocks of upper V used as grave lining; (k) lower jaw of a five-year-old child disturbed from Layer VI and reburied with the Layer IV child; (l) teeth of five-year-old child in apparently undisturbed VI; (m) upper limit of sharpening marks on wall; (n) lower limit of same; (o) position of bone implement in hole in wall; (p) *Sarcophilus* teeth; (q) *Sarcophilus* jaw; (r) deciduous human incisor; (s) geminate deciduous human incisor.

present in each layer; these numbers have been plotted, together with an indication of the average thickness of each level (p. 214).

Statistics were also kept of the approximate numbers of stone implements and unworked flakes and of the types of material utilized in each level. The materials here referred to as "chert" comprise fine-grained siliceous rocks of chert, flint, and opal types. These cherts exhibit a great range of colour, but in all levels a dull grey to yellowish flinty-chert is by far the most abundant.

DESCRIPTIONS OF LAYERS I–XII.

Layer I (Late Murundian). A white to yellow limy layer from 15 to 75 cm. in depth. It contains much ash and numbers of occupational horizons indicated by dense *Unio* hearths, burnt stones, and dark brown bands. The uppermost levels are preserved only in the back of the shelter. There is a layer of broken *Unio* shells at the base of this bed, lying on a comparatively sterile and continuous chocolate-coloured band (from 3 to 10 cm. in thickness), which forms the top of the writers' layer II.

The *Unio* shells have retained the whole of their epidermis; animal bones are unaffected, and partly charred plant remains, such as stems of sedges, have not completely perished.

MUSSELS: *Unio vittatus, U. angasi, U. ambiguus,* and *Corbicula angasi.*

UNIVALVES: *Melania balonnensis, Paludina hanleyi,* and *Bulinus texturatus.*

CRAYFISH: *Parachaeraps bicarinatus* and *Astacopsis serratus.*

FISH: *Oligorus macquariensis* (Murray Cod) and *Tandanus tandanus* (Cat fish); vertebrae and spines of other fishes.

TORTOISE: *Chelodina longicollis.*

SNAKE: *Python spilotes.*

LIZARDS: *Tiliqua* and *Amphibolurus.*

MAMMALS: *Isoodon* cf. *obesulus* (Short-nosed Bandicoot), *Perameles* cf. *myosura* (Barred Bandicoot), *Trichosurus* cf. *vulpecula* (Common Opossum), *Bettongia* (Rat Kangaroo), *Potorous* (Rat Kangaroo), *Lagorchestes* cf. *leporoides* (Hair-wallaby), *Macropus* (Kangaroo), *Lasiorhinus* (Wombat), *Rattus* (Native Rat), and *Canis familiaris* (Dingo).

PLANTS: Sedge stems and *Eucarya acuminata* (Quandong stones).

ARTEFACTS: One worn oval quartzite hammer-stone, a few quartzite chippings, and two dozen nondescript flakes of variously coloured chert; also red ochre of three shades.

Layer II (Murundian). Varies in thickness from 20 to 80 cm. The upper limit is a thin chocolate-coloured continuous band. Below this are yellowish ashy deposits containing a rock-fall, two continuous beds of darker concentrated ash,

and numerous lenticular hearths of the same material. Below the outer part of the shelter the lower limit of the layer is defined by a fall of limestone boulders which sealed lower deposits. In the inner part of the shelter the material of this layer lies directly on a rocky shelf (see fig. 41). The epidermis is sometimes retained on the *Unio* shells.

MUSSELS: *Unio vittatus, U. ambiguus, U. angasi,* and *Corbicula angasi.*

UNIVALVES: *Melania balonnensis, Paludina hanleyi, Bulinus texturatus. Xanthomelon eyrei,* and *Bulimus adelaidae.*

CRAYFISH: *Parachaeraps bicarinatus* and *Astacopsis serratus.*

FISH: *Oligorus macquariensis* and *Plectroplites ambiguus* (Callop).

BIRDS: *Dromaeus novae-hollandiae* (Emu) and *Biziura lobata* (Musk-duck).

MAMMALS: *Phascogale* cf. *flavipes* (Yellow-footed Pouched-mouse), *Perameles, Trichosurus* cf. *vulpecula, Lagorchestes* cf. *leporoides, Thylogale* (Scrub Wallaby), *Macropus, Rattus,* and *Canis familiaris.*

PLANTS: *Eucarya acuminata.*

HUMAN REMAINS: In the south-western corner of the excavation, at a depth of 140 cm., the bones of a young baby (fig. 41, a) were unearthed. All were probably associated, but some were disturbed before their arrangement could be recognized. The shape of the grave was clearly traceable, and it was apparent that the infant had been buried from the level of the lower of the two dark bands of concentrated ash (at 120 cm.); the grave was intrusive on the bottom of layer II.

Dentition (T. D. Campbell). The teeth of this specimen form an incomplete deciduous set, consisting of thin calcified shells of the crown portions of the teeth. In the anterior teeth represented development has reached the stage of almost complete crown form as regards external dimensions; in the molar representatives only about two-thirds of the crown is calcified. The teeth comprise: complete upper set excepting the right lateral incisor and the left canine; the lower series is represented by two canines and two first molars. The stage of development suggests an age of about three months.

ARTEFACTS: One irregular fragment of bone scraped to a point, and with polished edges. One crude quartz scraper, rectangular in shape, with indication of retouch; twenty-three chippings of chert, five fragments of quartzite and two of micaceous schist. Small pieces of red and brownish ochre.

Layer III (Murundian). Is approximately 65 cm. in thickness. Its upper part consists of yellowish limy debris similar to that of II. In the middle there is a well-defined continuous greyish-black horizon about 10 cm. in thickness. In the lower half is another dark band, the outer part of which has been eroded away so that the upper black deposit, beyond this truncated band, rests directly

on the lowest level of the layer. A harder stratum of the cliff projected outward at the bottom of this level, forming a narrow ledge (fig. 41, d) with creviced and rugged upper surface. This bears a small amount of detritus characteristic of levels V to VII.

The principal mussels are thin-shelled *U. angasi, U. ambiguus* being rare. Two examples were recovered of a species apparently identical with specimens from Moonlight Creek and Connexion Island (Gulf of Carpentaria), and from Paradise Lagoon, Fitzroy River, N.W. Australia, labelled as "*U. stuarti* Adams and Angas"; also with others from Newcastle Waters, North Australia, labelled "*U. bednalli,* Tate." All shells are entirely without epiderm.

The bones from the yellow upper debris are paler in colour than the others, which are a deep brown.

MUSSELS: *Unio angasi, U. ambiguus, U.* cf. *stuarti,* and *Corbicula angasi.*

UNIVALVES: *Paludina hanleyi, Melania balonnensis,* and *Bulinus texturatus.*

CRAYFISH: *Parachaeraps bicarinatus* and *Astacopsis serratus.*

FISH: *Oligorus macquariensis* and *Plectroplites ambiguus.*

BIRDS: *Dromaeus novae-hollandiae* and *Uroaetus audax* (Wedgetail-eagle).

SNAKE: *Python spilotes.*

LIZARDS: *Tiliqua* and *Amphibolurus.*

TORTOISE: Unidentifiable fragments.

MAMMALS: *Pseudochirus* (Ring-tailed Opossum), *Bettongia, Lagorchestes* cf. *leporoides, Macropus, Thylogale,* and *Rattus.*

PLANTS: *Eucarya acuminata.*

HUMAN REMAINS: Against the rock wall and near the middle of the width of the excavation, at a depth of 190 cm., a rectangular block of cliff limestone (50 cm. x 40 cm. x 20 cm.) was encountered (fig. 41, c). It proved to have on its lower surface a shallow circular depression, indicative of its use as a nether mill. It was uniformly covered with the greyish-black deposit, and above it were seals of the yellowish debris containing stratified *Unio.* Below the slab was the skeleton of a young child (aet. c. 15-18 months), lying on the right side in a partly flexed position with the head to the north-east. Examination showed that a grave 1 metre in length and 0·5 metre in width had been excavated to a depth of only 35 cm. from the (then) surface, and that on three sides stones had been placed as lining walls, the face of the previously mentioned projecting ledge of the back wall forming the fourth side. The slab of limestone was resting on the side-stones. It was evident that the vault had not been filled in before the slab was placed in position, for when uncovered it contained fine sifted dust of the greyish-black bed, and was not completely filled.

The almost complete skull (fig. 42), which is somewhat distorted, probably

through pressure of the large slab, and most of the other bones were recovered. These were stained rich brown. A few measurements of the skull are given.

Martin's No.		
1.	Greatest skull length [g–op]	162
8.	Greatest skull breadth [eu–eu]	116
9.	Smallest frontal breadth [ft–ft]	83
10.	Greatest frontal breadth [co–co]	100
20.	Ear-bregma height [po–b]	100
	Length–breadth index	72
	Length–auricular height index	62

A geminate deciduous human incisor was also found in this bed.

Fig. 42. Skull of child from Layer III, Devon Downs, *norma lateralis* (½ nat. size).

Dentition (T. D. Campbell). The distortion of the skull of the child from layer III, mentioned above, has not extended to the jaw region, which is markedly prognathous (fig. 42). The mandible is nearly complete, lacking only a small portion of the ventral margin of the left ramus.

The deciduous teeth are all present and are very large; the partly formed crowns of the first permanent molars are visible in their crypts, but are not readily accessible for examination. The dental condition suggests an age between fifteen and eighteen months.

A striking isolated find from this layer consists of an example of the rather unusual condition of gemination of the deciduous teeth. The teeth concerned are probably the lower left central and lateral incisors. There is complete fusion of the crown and root portions, with a vertical grooving labially and lingually, marking the junction; the root of the geminate tooth is considerably absorbed.

ARTEFACTS: A single mineralized double-pointed bone implement (elsewhere called a "*muduk*") of a type common in levels V to VII. This implement (fig. 154) was associated with a jaw of *Lagorchestes* cf. *leporoides* and a few other bone fragments, at a depth of 190 cm., on the aforementioned rocky ledge against the back of the shelter; the facies of these remains is characteristic of layer V and earlier. It may be surmised, therefore, that they represent a cache deposit on the ledge. No other bone implement was found in either layer III or IV.

Three crude discoidal scrapers, two of chert and one of quartz. Thirty nondescript chippings of chert, and twelve of quartz.

Layer IV (Early Murundian). Consists of a metre of alternating thin bands of yellow and grey to black deposits. The upper limit is defined by a uniform black band at 215 cm. There is a well-marked brown stratum, about 10 cm. in thickness, near the bottom of IV and immediately overlaying a thin black band. The bottom, where not covered by a large fall of rock, is defined by a white limy deposit forming the uppermost level of our layer V. In the area excavated this rock-fall consisted principally of a large block, of a maximum thickness of a metre, and occupied the greater part of the area of our excavation. The shape, position, and dimensions of this mass show that it has fallen from the roof of the shelter. Its former position can be clearly traced, and on the smooth surface of the hollow resulting from the detachment of it are "carvings" of one of the types described by Sheard (1927). The reddish colour of the upper surface of the fallen mass (due to burning) shows that it had been the site of numerous fires during the occupancy of the lowest levels of IV.

MUSSELS: *Unio angasi, U. ambiguus, U. vittatus,* and *Corbicula angasi.*

UNIVALVES: *Paludina hanleyi, Bulinus texturatus,* and *Melania balonnensis.*

CRAYFISH: *Parachaeraps bicarinatus* and *Astacopsis serratus.*

FISH: *Oligorus macquariensis* and *Tandanus tandanus.*

TORTOISE: *Chelodina longicollis.*

LIZARD: *Tiliqua* and *Varanus* cf. *gouldii.*

BIRDS: *Dromaeus novae-hollandiae.*

MAMMALS: *Isoodon* cf. *obesulus, Pseudochirus, Bettongia, Lagorchestes* cf. *leporoides, Macropus* cf. *giganteus* (Grey Kangaroo), *Thylogale, Lasiorhinus* or *Phascolomys* (Wombat), *Rattus,* and *Canis familiaris.*

PLANTS: *Eucarya acuminata.*

Of the mussels *U. angasi* is very common, *U. ambiguus* moderately plentiful, and *U. vittatus* rare.

HUMAN REMAINS: In the "brown level" were some white limy nodules (containing light-coloured remains of various animals), which proved to belong to layer V and to have been thrown out on the surface of this deposit during the excavation of a deep grave transgressing layer V and part of VI (fig. 41, h, i). The greatest length of the grave was one metre and its breadth half a metre, and it was situated lengthwise against the back wall of the shelter in the only part not sealed by the big rock-fall. It was traced downward to 430 cm. from datum, where it was found to contain a child's skeleton protected by a few large blocks of limy material (fig. 41, j), which proved to be consolidated pieces of the white deposit in layer V. In the mixed debris filling this grave an almost

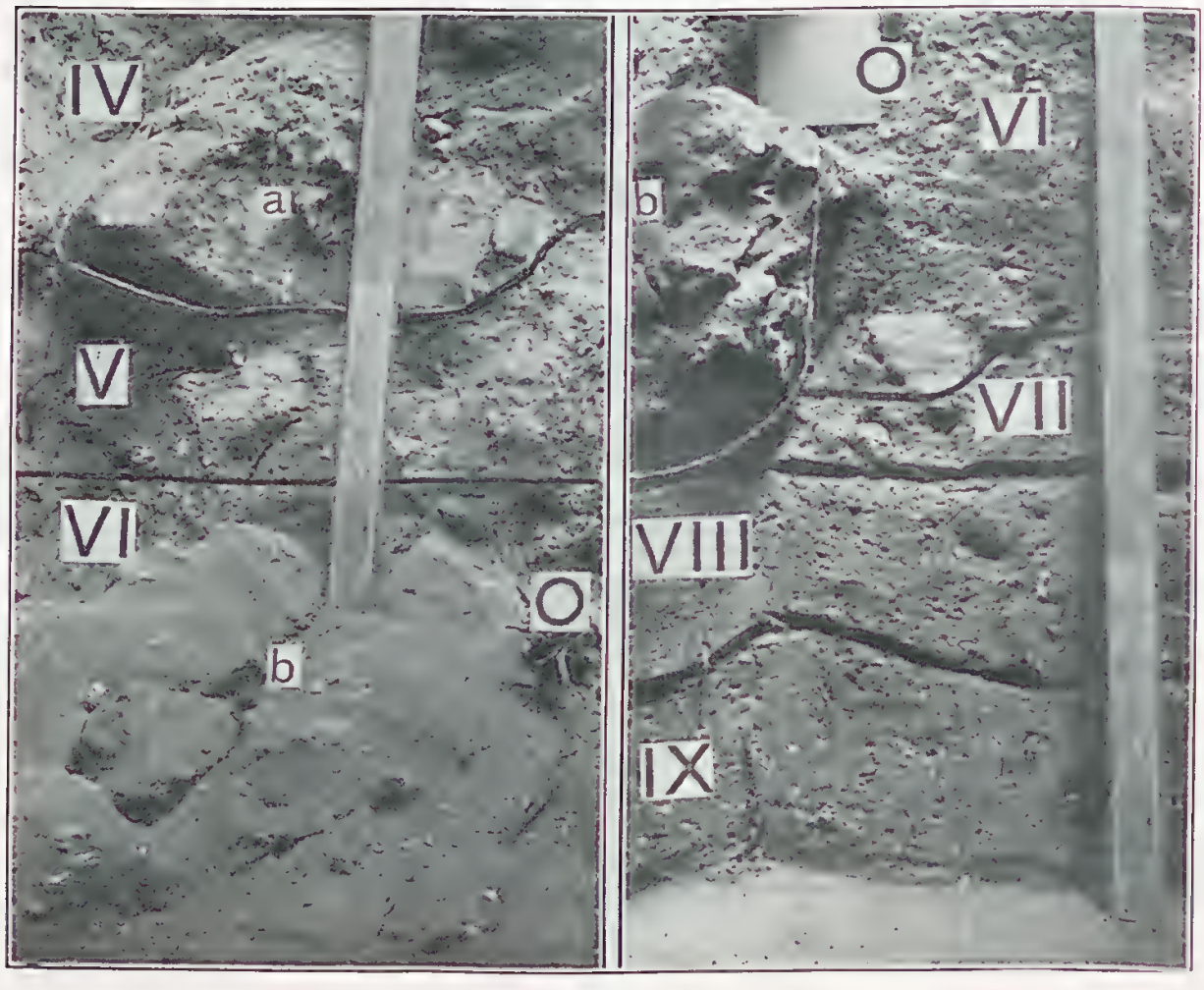

Fig. 43. South-western wall of excavation, showing parts of Layers IV-VI; a indicates unremoved portion of the rock on Layer V (see fig. 41e); b, rock fall on to Layer VII, before removal.

Fig. 44. Same wall at later period of excavation, showing remnants of rock fall b; the centimetre scale is standing on Layer X; O indicates the same spot in this and the preceding figure.

complete human lower jaw and teeth were found at a depth of 400 cm. (fig. 41, k). These were encrusted with the limy material characteristic of layer VI, and are to be associated with a few other fragments representing an older burial which was disturbed by the excavators of the layer IV grave.

The remains of the "brown bed" infant when excavated lacked the lower left lateral incisor, four upper incisors, and the right upper canine and premolar. With the exception of the lower lateral, these teeth were subsequently recovered on the top of level VIII, where they had presumably fallen (perhaps from a pocket in the decomposed clay-like cliff limestone forming the back wall) during the breaking up and removal of a big rock (figs. 43-44, b) lying on bottom VII in the south-western corner of our excavation. It is necessary to direct attention to this apparent flaw in the excavating routine (between the 430 and 480 cm. levels), for this would have affected to a greater extent the stratigraphical evidence of layers V to VII had not the methods adopted enabled its effect to be limited to a definite, small area against the back wall.

Dentition (T. D. Campbell). Portion of a mandible with the proximal parts of the rami broken off, represents the dentition of the infant burial from the "brown level" of layer IV. All the deciduous teeth are present excepting the left lateral incisor. The half-formed crowns of the permanent molars are in their damaged crypts. With the exception of the upper right second molar all the upper deciduous teeth were found loose among the debris. These teeth are large, and present similar features as are indicated in the comments on the child from layer III (p. 216).

ARTEFACTS: Thirty-one definite implements, with well-defined retouch work; almost all occurred in the brown deposit. Twenty-eight are of chert, and three, which are cruder, are of quartz. They comprise (a) apparent attempts to form disc-scrapers or *"tula"* (figs. 45-48); (b) much worn *tula* (figs. 49-58), one with an edge polished by continued use (fig. 58) and one with an edge and one flat face also thus polished (fig. 59); (c) angular scrapers, with a long retouched edge (figs. 60-62); (d) nondescript or amorphous (figs. 63-65); fig. 63 illustrates a pebble with one side well worked and with secondary chipping.

In addition two hundred and thirty flakes of chert, forty-three of quartz, and one of quartzite were collected.

Exhaustive search did not bring to light any stone implements of definite type in the layers above IV.

Layer V (Mudukian). This is from 40 to 70 cm. in thickness. Its upper part is composed of a pure white consolidated limy band 25 to 30 cm. in thickness, with one thin darker horizon running through it; next is a dark brown ashy deposit 20 cm. in thickness separated, by a continuous dense *Unio* hearth, from

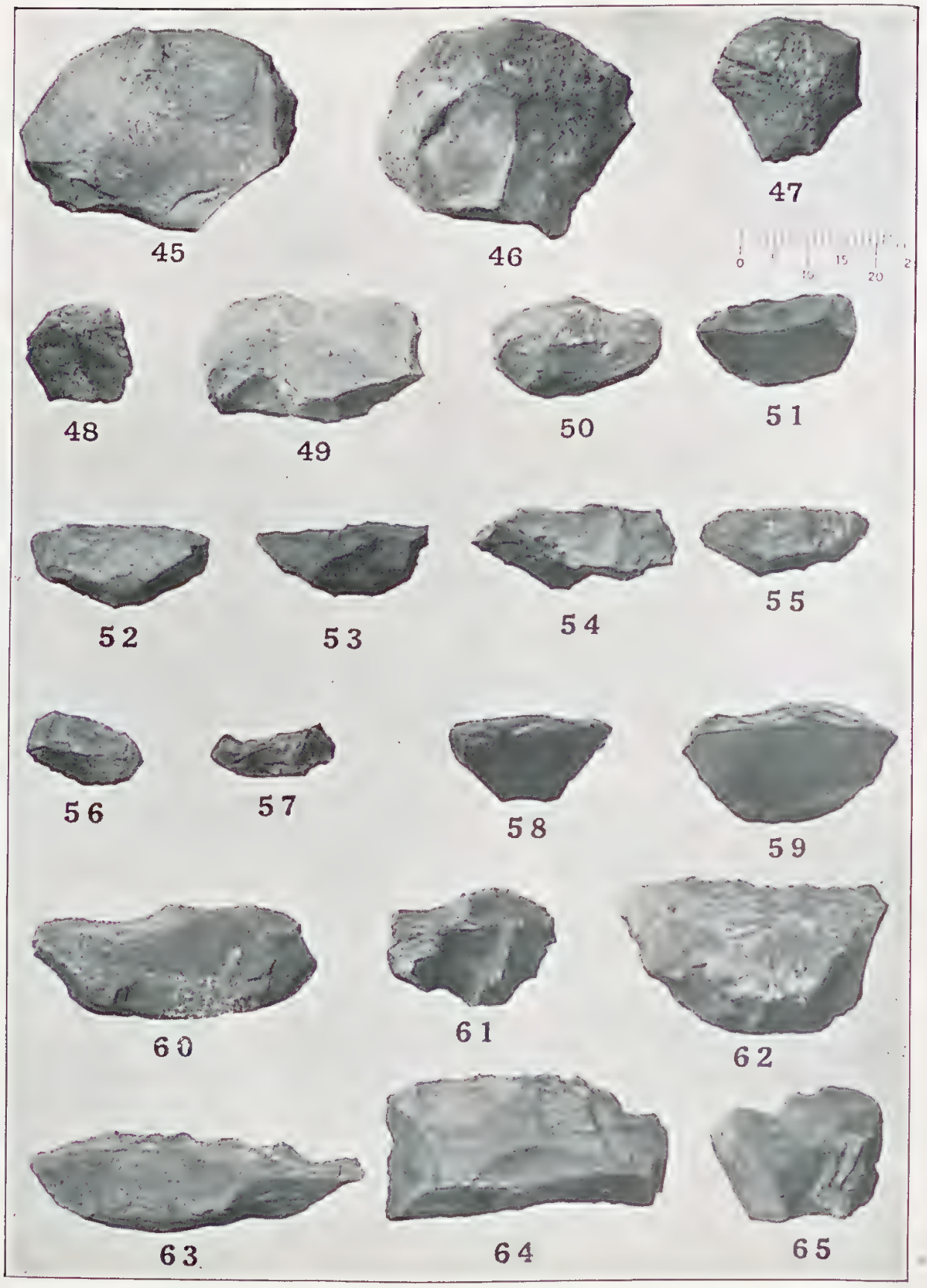

Fig. 45-65. "Murundian" stone implements from Layer IV, Devon Downs (nat. size).

an underlying white and grey limy nodular deposit, the bottom of which defines the lower limit of the layer. When cleared, the top of the upper limy bed had an irregular surface and a slope upwards to the western side of the excavation. Animal remains are relatively less abundant than in other layers, especially in the upper part, where the contained bones are all bleached white or bluish-white.

The back wall, where exposed by excavation, was found to be everywhere covered with short and, in some cases, deep grooves and scratch marks (figs. 41, m-n, and 66). These extend downwards from 300 cm. to 375 cm., thus corresponding closely with the vertical depth of the layer under discussion.

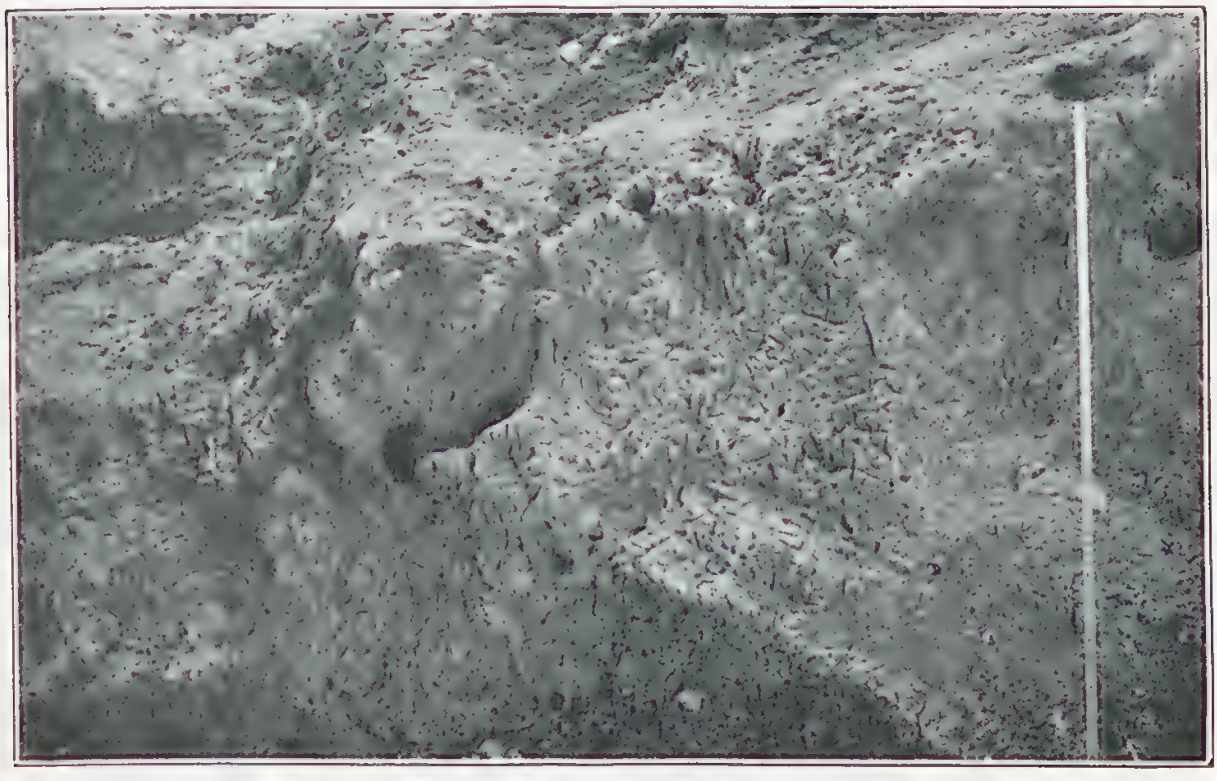

Fig. 66. Markings (of type A) on wall of shelter opposite Layer V, Devon Downs.

A cavity in the back wall, with a double entrance (at 325 cm., fig. 41, o, and also near the middle of fig. 66) contained about 10 cubic cm. of sterile grey dust and the apical portion of an obtuse pointed split bone implement (fig. 221).

MUSSELS: *Unio angasi, U. ambiguus,* and *Corbicula angasi.*

UNIVALVES: *Bulinus texturatus, Paludina hanleyi,* and *Melania balonnensis.*

CRAYFISH: *Parachaeraps bicarinatus.*

FISH: *Oligorus macquariensis.*

TORTOISE: *Emydura macquarii.*

LIZARDS: *Tiliqua* and *Amphibolurus.*

BIRDS: *Dromaeus novae-hollandiae* and *Chenopis atrata* (Black Swan).

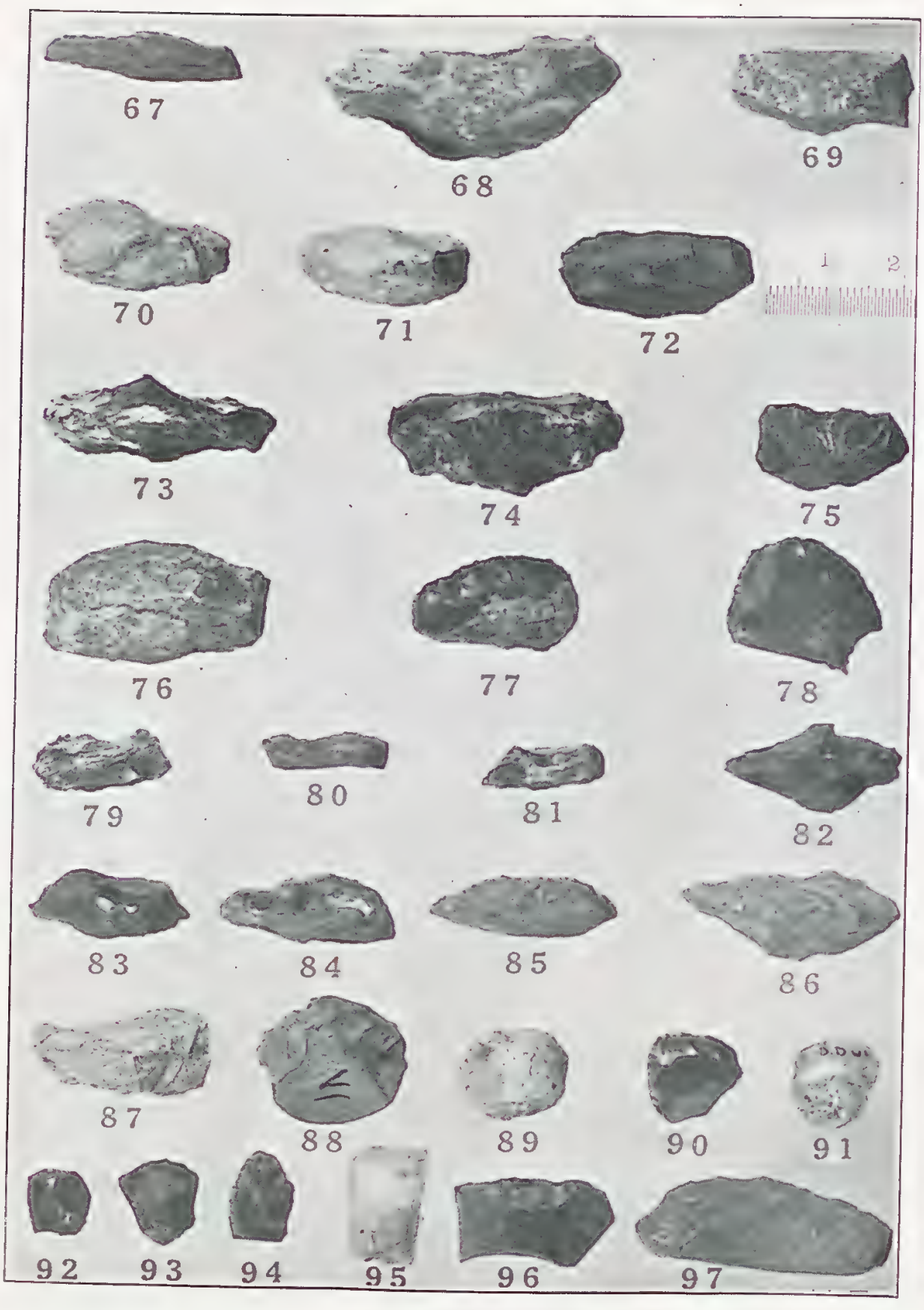

Fig. 67-97. "Mudukian" stone implements from Layers V (67-78) and VI (79-97), Devon Downs (nat. size).

MAMMALS: *Perameles* cf. *myosura, Lagorchestes* cf. *leporoides, Macropus* cf. *giganteus, Lasiorhinus* or *Phascolomys,* and *Rattus.*

ARTEFACTS: Four bone points, three of which are illustrated (figs. 98-100); three are fashioned from split bones by scraping and rubbing, while the fourth (fig. 98) is part of a pointed long bone. The bone (fig. 221) from the cavity in the back wall is similar to implements from layers VI to VII, which have not otherwise been found in layer V.

Thirteen stone implements, of yellow, red, and shiny black chert, and of dull yellow and white chert; eleven are of the worn-out *tula* type (figs. 67-76), and the other two are small discoidal scrapers (figs. 77-78).

The chippings comprise forty-four of various cherts, six of quartzite, and seventeen of milky quartz.

In addition there were six small pieces of ochre of three shades.

Layer VI (Mudukian). On the eastern half of the excavation the white and grey limy nodular deposit of V is preceded abruptly by a broad band of brownish-yellow material about 20 cm. in thickness. On the outer part of the western half, these two bands are separated by a scattered fall of rocks with a maximum thickness of 20 cm. In the south-western portion of the hole, against the wall, the top of a large rock was encountered at about 400 cm.; this rock extended downwards through the next layer, and occupied one-fourth of the area of the excavation. The upper surface of this mass, before removal, is shown in fig. 43. The brownish-yellow material merges into a dark brown deposit (20 cm. in thickness and of similar nature), which is rather well defined, above and below, by dense layers of broken *Unio* shell. The lowest stratum of VI is black and contains much burnt *Unio* debris, also bone fragments, chippings, and implements in great abundance.

It was difficult to find mussels sufficiently perfect for determination, and only one almost complete, but fragile valve of *Unio vittatus* was secured. Emu egg-shell was abundant.

MUSSELS: *Unio ambiguus, U. angasi, U. vittatus,* and *Corbicula angasi.*

UNIVALVES: *Paludina hanleyi, Bulinus texturatus,* and *Melania balonnensis.*

FISH: *Oligorus macquariensis.*

TORTOISES: *Emydura* cf. *macquarii* and *Chelodina* cf. *longicollis.*

LIZARDS: *Trachysaurus rugosus, Tiliqua,* and *Amphibolurus.*

MAMMALS: *Sarcophilus* cf. *harrissi* (Devil), *Perameles* cf. *myosura, Trichosurus* cf. *vulpecula, Bettongia, Potorous, Lagorchestes* cf. *leporoides, Macropus* cf. *giganteus, Macropus, Thylogale, Lasiorhinus* or *Phascolomys, Hydromys* cf. *chrysogaster* (Australian Water Rat), and *Rattus.*

HUMAN REMAINS: The greater of the lower jaw, some other teeth, and a few

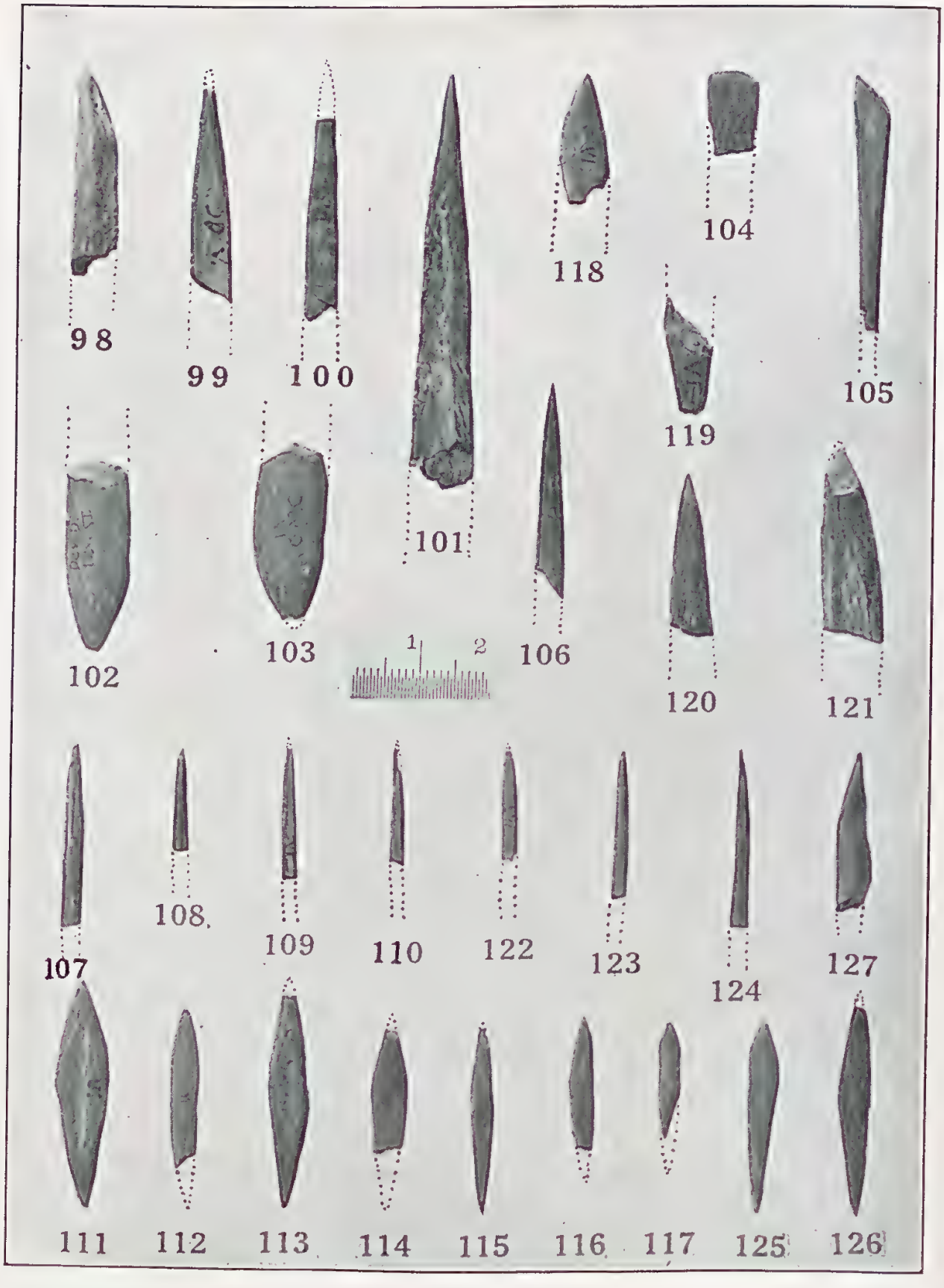

Fig. 98-127. "Mudukian" bone implements from Layers V (98-100), VI (101-119), and VII (120-127), Devon Downs (nat. size).

fragments of the calvarium of a child of about five years of age were found (fig. 41, k and l); only two of the teeth were taken in layer VI, the rest occurring in the area disturbed during the burial of the infant from the brown level of layer IV. Owing to this intrusion it cannot be stated with certainty from what level in V or VI the older remains were first buried. The jaw when found was coated with limy deposit similar to that on bones from layer VI, so that originally it may have been buried from a surface in that layer, although there is no other reason for excluding the possibility of its interment from any level below the top of layer V.

Dentition (T. D. Campbell). The specimens consist of an incomplete mandible with the articular portion of the right ramus missing. All the teeth are present excepting the right deciduous canine. Some of the permanent teeth are still contained in their crypts. Associated with this jaw were found several upper teeth—a right deciduous first molar and a first permanent premolar with incomplete root.

The condition of the teeth suggests an age of approximately five years. The attrition is typical, and on the whole jaw and teeth shows no marked differences from other young aboriginal jaws of similar age.

ARTEFACTS: Portions of thirty-seven bone implements, nineteen of which are figured. Five types are represented, (a) a long, tapering split bone (fig. 101) and two obtusely rounded split bones, which may represent the opposite extremity of artefacts of the same sort (figs. 102-103); (c) two split bones with one end truncate or oblique and polished, possibly by use as rubbers or scrapers (figs. 104-105 and 152); (d) thirteen finely-pointed, slender, awl-like bones (figs. 106-110); (e) eight double-pointed fusiform artefacts, made from split bone, and scraped and highly polished at both ends (figs. 111-117, and 153 and 155); one example bears a mark in the form of a cross on one face (figs. 113 and 155).

The last-named (fusiform bones) are similar to the type said to have been used for fishing (see p. 205); as their name is unknown, the Murundian word for bone, "*muduk*," is here adopted for them. A single example was found on the ledge opposite layer III.

Other fragments of bone implements include broken points (figs. 118-119) and shafts similar to that from layer V, illustrated in fig. 100.

Of twenty-four stone artefacts, nineteen are of chert and five of quartz. Twelve are worn-out *tula* or fragments of such (figs. 79-87 and 128-130), six are nondescript microliths and irregular flakes with secondary work (figs 92-97), and six are discoidal or subdiscoidal "thumbnail" scrapers (figs. 88-91).

Chippings without retouch comprise one hundred and forty of various cherts, one hundred and twelve of quartz, and twenty-five of quartzite.

Other detritus includes a piece of resin *(?Xanthorrhoea)* and seventy-five fragments of various ochres.

Layer VII (Mudukian). Consists of a layer, 10–25 cm. in thickness, of brownish deposit, containing some yellow cliff debris. It is shallowest near the wall. The big rock mass in the south-western corner (mentioned as extending upwards through VI) rests on the bottom of this layer (fig. 44, b).

Jaws of small mammals are particularly abundant; fish bones are scarce, and no crustacean remains were found. The bulk of the debris, other than *Unio* shells and ash, consists of bone fragments; relatively the occupational debris is much more abundant in this thin layer than in any of the other layers above.

MUSSELS: *Unio angasi, U. vittatus, U. ambiguus,* and *Corbicula angasi.*

UNIVALVES: *Paludina hanleyi, Bulinus texturatus,* and *Melania balonnensis.*

FISH: *Oligorus macquariensis, Plectroplites ambiguus,* and *Tandanus tandanus.*

TORTOISES: *Chelodina* and *Emydura.*

REPTILES: *Tiliqua, Amphibolurus,* and *Trachysaurus rugosus.*

BIRDS: *Dromaeus novae-hollandiae, Querquedula* (Teal).

MAMMALS: *Dasyurus* cf. *geoffroyi* (Black-tailed Native Cat), *Dasyurus* cf. *viverrinus* (Common Native Cat), *Perameles* cf. *myosura, Trichosurus, Bettongia, Lagorchestes* cf. *leporoides, Macropus* cf. *giganteus, Macropus,* and *Lasiorhinus* or *Phascolomys.*

ARTEFACTS: Portions of thirteen bone implements, of which eight are figured. The types represented are (a) two examples of the acutely pointed split bones (fig. 120); (b) two stouter examples dressed to a more obtuse point (fig. 121); (c) five examples of slender round bones tapering to a fine point (figs. 122-124); one of these was later associated with portion of its butt-end, as shown in fig. 157; (d) two of the double-pointed fusiform type (figs. 125-126 and 156); (e) a single rough bone fragment, the end polished to a point, the remainder wholly unworked (fig. 127).

One quartz-crystal and seventeen chert implements; fourteen of the latter are much-worn *tula* (figs. 135-147); another has had less use (fig. 148).

Of three crude microliths, one is a subspherical crystal "thumbnail" scraper (fig. 150) and two are flat, sub-rectangular chert scrapers (figs. 149, 151). One much-pounded quartz pebble hammer-stone was recovered.

Chippings include sixty of chert, thirty-five of quartz, and nine of quartzite. Sixteen ochre fragments, of five grades, were present.

Layer VIII (Pirrian). This layer is composed of from 30 to 40 cm. of grey homogeneous material, containing only one well-defined stratified *Unio* horizon. In our field data we note "there is a sudden change in the character

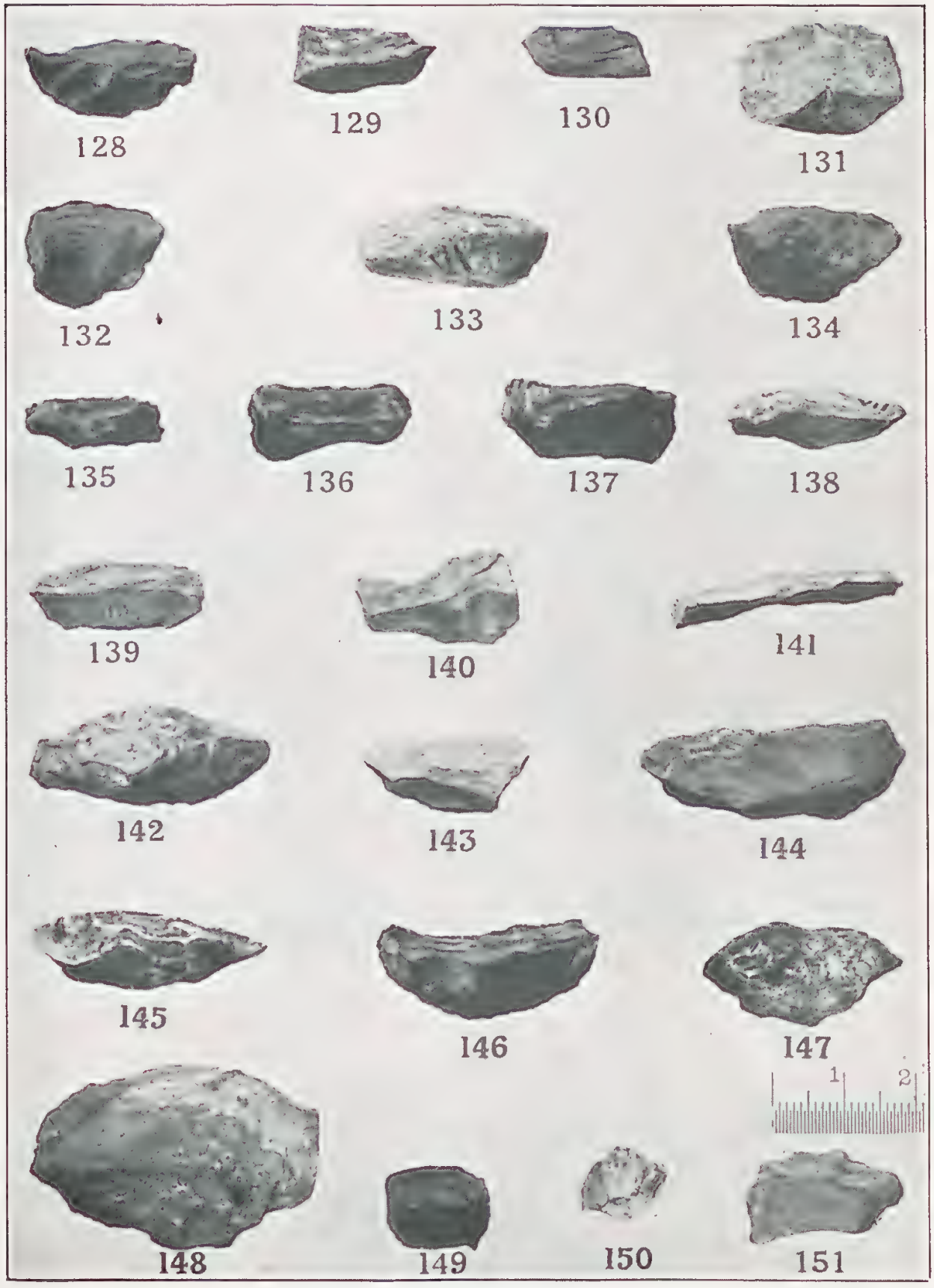

Fig. 128-151. "Mudukian" stone implements from Layers VI (128-134) and VII (135-151), Devon Downs (nat. size).

of the deposit and its contents; at first sight we were inclined to consider it comparatively sterile, but this was only because of the different type of remains. Small mammal jaws seem to be scarce, and bone fragments are commonly those of larger animals." At the conclusion of the clearing of this layer we comment "there is a greater bulk of bone fragments than in any other layer; also more broken *Unio* debris. The material is very dirty throughout, so that one does not realize the amount present in unsifted and unwashed material."

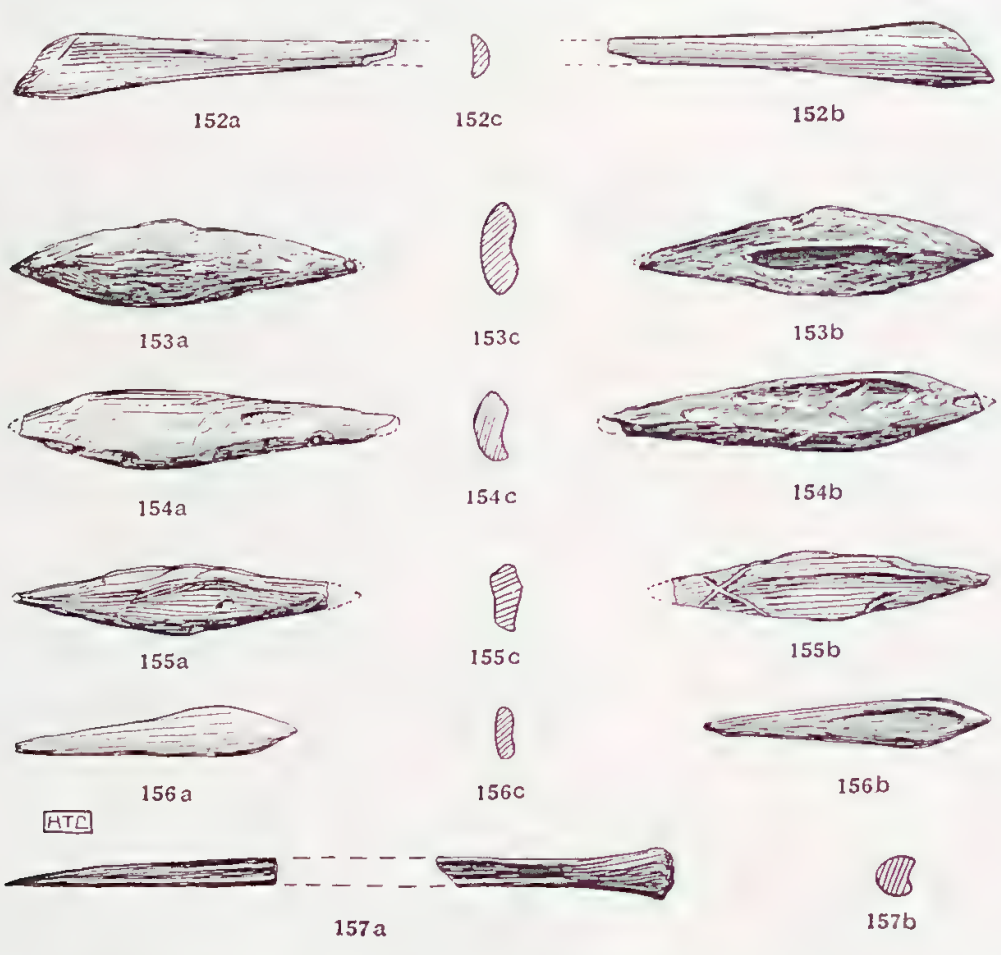

Fig. 152-157. "Mudukian" bone implements from Layers VI (152-153), VII (155-157), and the example from deposit on ledge opposite Layer III (154), Devon Downs (nat. size).

MUSSELS: *Unio ambiguus, U. angasi,* and *Corbicula angasi.*
UNIVALVES: *Paludina hanleyi, Bulinus texturatus,* and *Melania balonnensis.*
CRAYFISH: *Parachaeraps* (carpus of a cheliped).
FISH: *Oligorus* (very large vertebrae and a statolith).
TORTOISES: *Emydura* cf. *macquarii* and *Chelodina* cf. *longicollis.*
LIZARDS: *Trachysaurus rugosus* and *Amphibolurus.*
BIRDS: *Dromaeus novae-hollandiae.*
MAMMALS: *Sarcophilus* cf. *harrissi, Perameles* cf. *myosura, Trichosurus* cf.

vulpecula, Bettongia, Lagorchestes cf. *leporoides, Macropus* cf. *giganteus, Macropus, Phascolomys* or *Lasiorhinus,* and *Rattus.*

ARTEFACTS: One complete and eighteen broken bone implements. The types represented are: (a) bluff-pointed round bones (figs. 158-161 and 174; (b) several shafts of scraped round bones; (c) two awls (figs. 162-163 and 175); (d) four points and three butts of split bone implements (figs. 164-170 and 173); (e) a broken fragment of bone with abraded or polished edges; this bears four transverse incisions near one end, and has been broken across at the first and longest of these cuts (fig. 171).

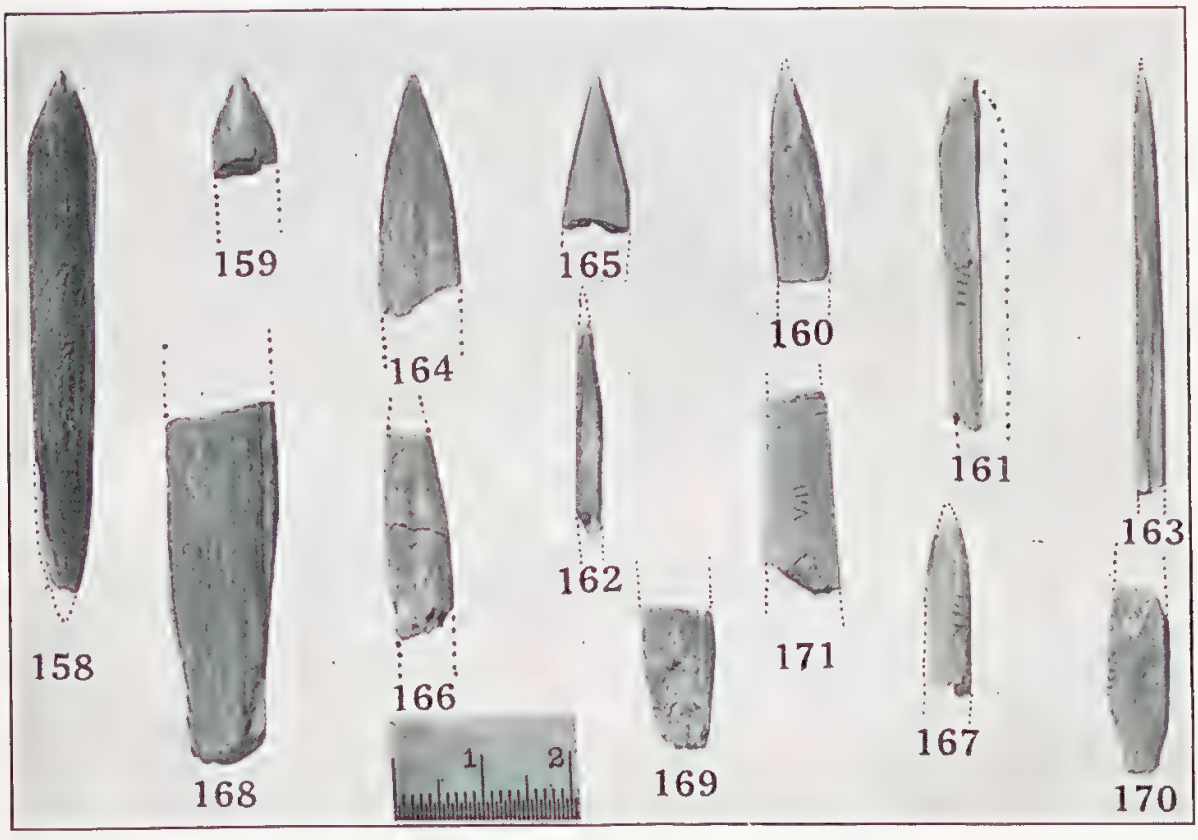

Fig. 158-171. "Pirrian" bone implements from Layer VIII, Devon Downs (nat. size).

The round-bone, bluff-pointed type, is represented by one almost perfect example and by several portions. They are made from the fibulae of wallabies. In the best preserved example the thicker end is tapered suddenly to an acute, highly polished point; the other end is slightly injured, but was also apparently pointed (fig. 174). Marks of the scraping tool employed in its manufacture are evident over practically the whole of the surface. Two fragments (one of which is shown in fig. 159) probably represent the extremities of another example of this type; the tool marks on their surfaces are similar. Fig. 161 represents a specimen which has become split longitudinally, and has then received further

scraping and polishing on the broken face near the tip. The greater part of a large flat split bone implement, lacking only the point, bears several deep incisions (fig. 173). The posterior portion was photographed (fig. 168) before the remainder was found in the bone debris brought back to Adelaide in bulk.

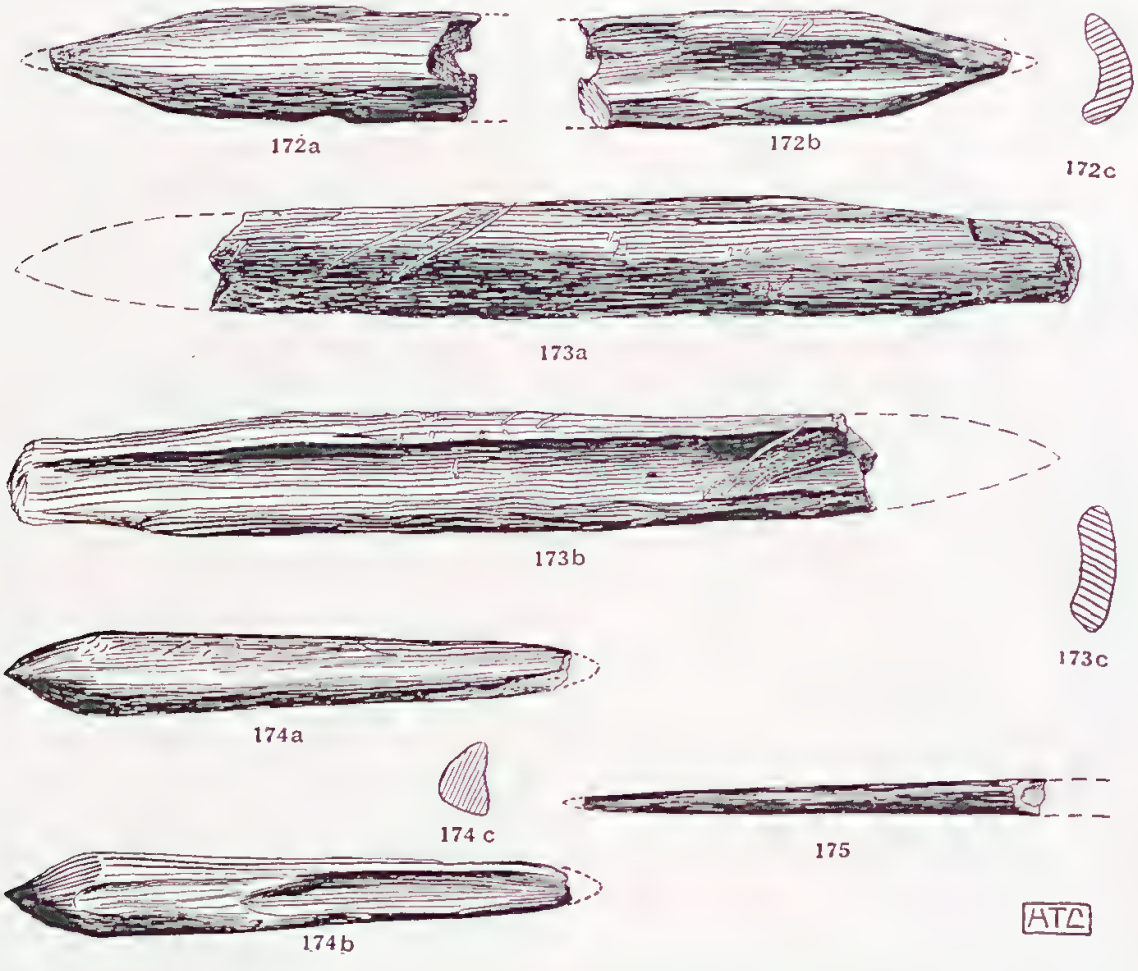

Fig. 172-175. "Pirrian" bone implements from Layer VIII, Devon Downs (nat. size).

Among the stone implements are fifteen examples of a type which is not found in any layer above; these are leaf-shaped points, fashioned from flakes of dull chert (figs. 176 and 183-189). In the manufacture it would appear that an elongate leaf-like flake, triangular or trapezoidal in cross-section, was struck off from a prepared core which had a flat striking platform. This flake was thinnest at the point of final separation from the core. Its ventral surface is usually free from marked ripples, while radiating fissures are generally confined to the point of impact; a positive bulb of percussion is often apparent. The dorso-lateral margins and posterior angles are retouched by hammer-flaking and the basal portion (striking platform) may or may not be retouched. This type of implement has been figured by Horne and Aiston (1924, pp 90-91) under the

name of *"pirrie" (pirri);* and although their application was seemingly made in error (see p. 205) this published name is here adopted in preference to any other.

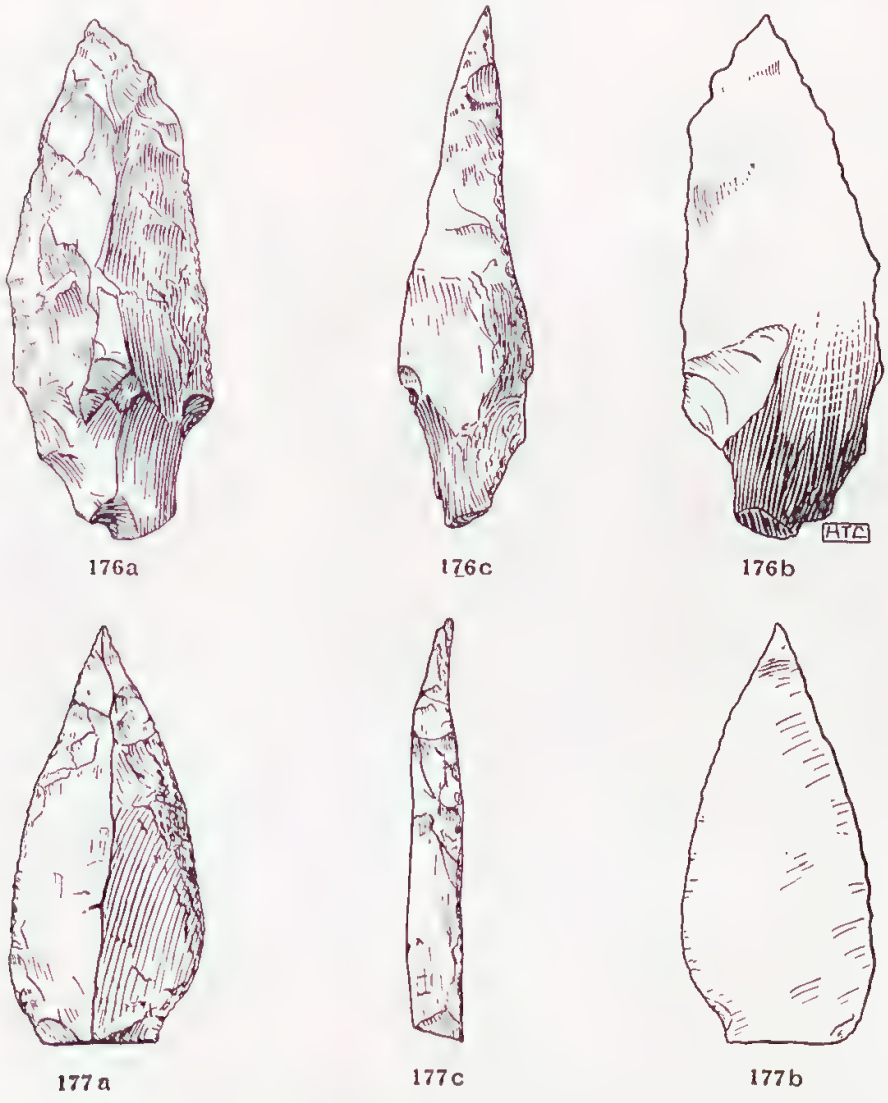

Fig. 176-177. "Pirrian" stone implements from Layers VIII and IX, Devon Downs (nat. size).

Other stone artefacts include two quartz discoidal scrapers, possibly *tula* with much-worn edges (figs. 193-194); the refractory material is evidently not suitable for continued retouch. Two chert *tula* are similar to worn examples from layers above (figs. 190-191); three other implements may have been *tula,* but have been retouched in an anomalous manner (figs. 192, 195, and 197).

Six small implements do not correspond to any special type. They comprise a pointed chert flake (fig. 198) with retouched back; an elongate oval flake (fig. 196) chipped all round, an irregular concave scraper with two notches (fig. 199), an oval fragment retouched on both faces (fig. 202), and two irregular or broken chips with secondary work on one margin only (figs. 200-201).

Chippings include ninety of various cherts, mostly of a dull white appearance, thirty-four of milky quartz, and six of quartzite. Only two small fragments of red ochre were recovered.

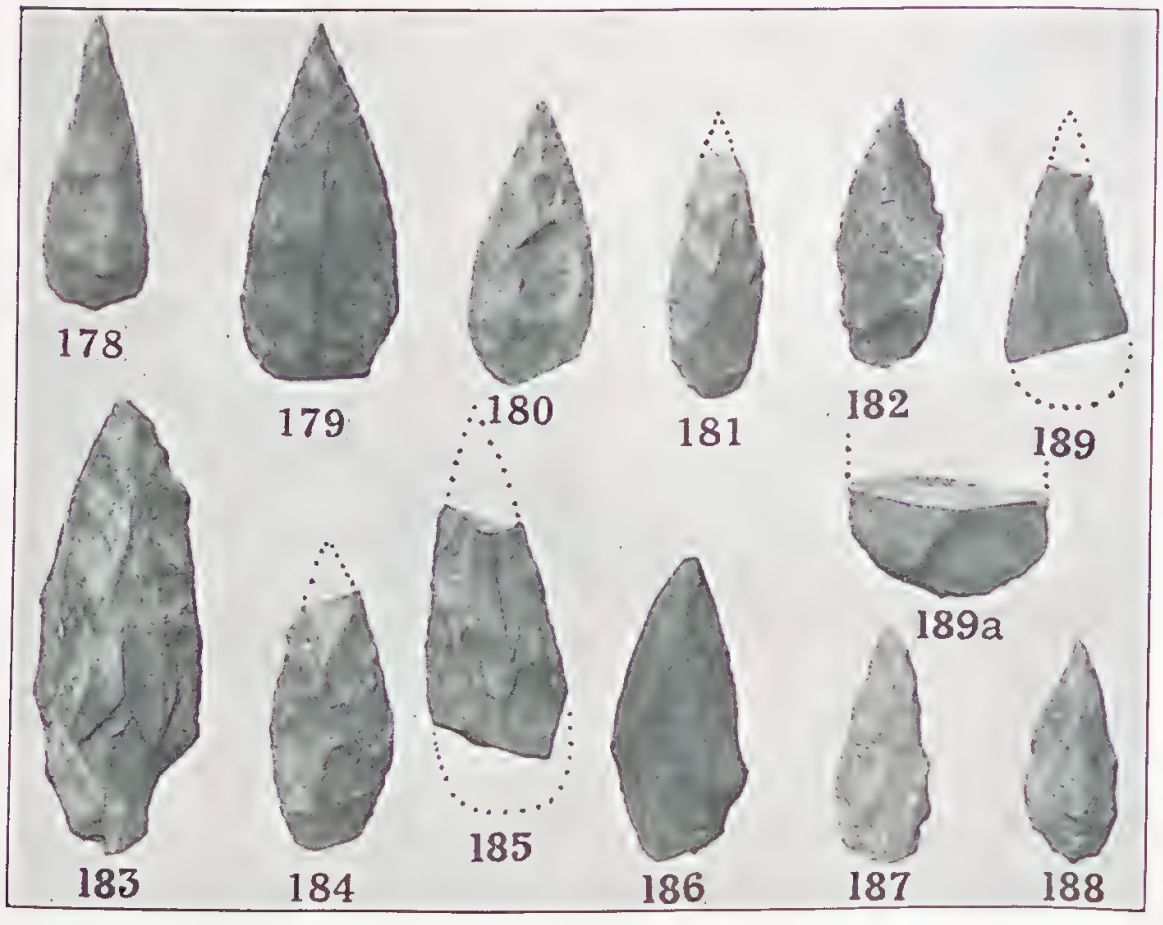

Fig. 178-189. "Pirrian" stone implements from Layers VIII (183-189) and IX (178-182), Devon Downs (nat. size).

Layer IX (Pirrian). Consists of a nearly horizontal layer 30 to 35 cm. in thickness, of greyish-brown material, showing few signs of lamination. The ratio of debris to ash is high. Bone fragments, usually of large animals, are numerous, but jaws are scarce. *Unio angasi* is abundant; many of the shells are large, all are fragile, and only a few could be saved for measurement. One example, 41 cm. in width, was exceptionally thick shelled (6·9 mm.). *Sarcophilus* is here represented by portion of a mandible and some other bones.

MUSSELS: *Unio angasi, U. ambiguus, U. vittatus* (a single example), and *Corbicula angasi.*

UNIVALVES: *Paludina hanleyi, Bulinus texturatus, Melania balonnensis,* and *Xanthomelon* cf. *eyrei* (two examples).

FISH: *Oligorus* (very large vertebrae).

TORTOISES: *Chelodina* cf. *longicollis* and *Emydura*.

LIZARDS: *Amphibolurus* and *Trachysaurus*.

BIRD: *Dromaeus novae-hollandiae*.

MAMMALS: *Sarcophilus* cf. *harrissi* (fig. 214), *Perameles* cf. *myosura*, *Bettongia*, *Lagorchestes* cf. *leporoides*, *Thylogale*, *Macropus*, *Lasiorhinus* or *Phascolomys*, and *Rattus*.

ARTEFACTS: Portions of eleven bone implements: (a) parts of three "round-bone" points (figs. 203-204, 212, and 223); (b) the rounded butt of a long artefact with the usual indications of scraping (fig. 205 and 222); this is possibly made from a bone of *Sarcophilus* cf. *harrissi*, as portion of a jaw of this animal from the same horizon exhibits the same peculiar graining and staining (fig.

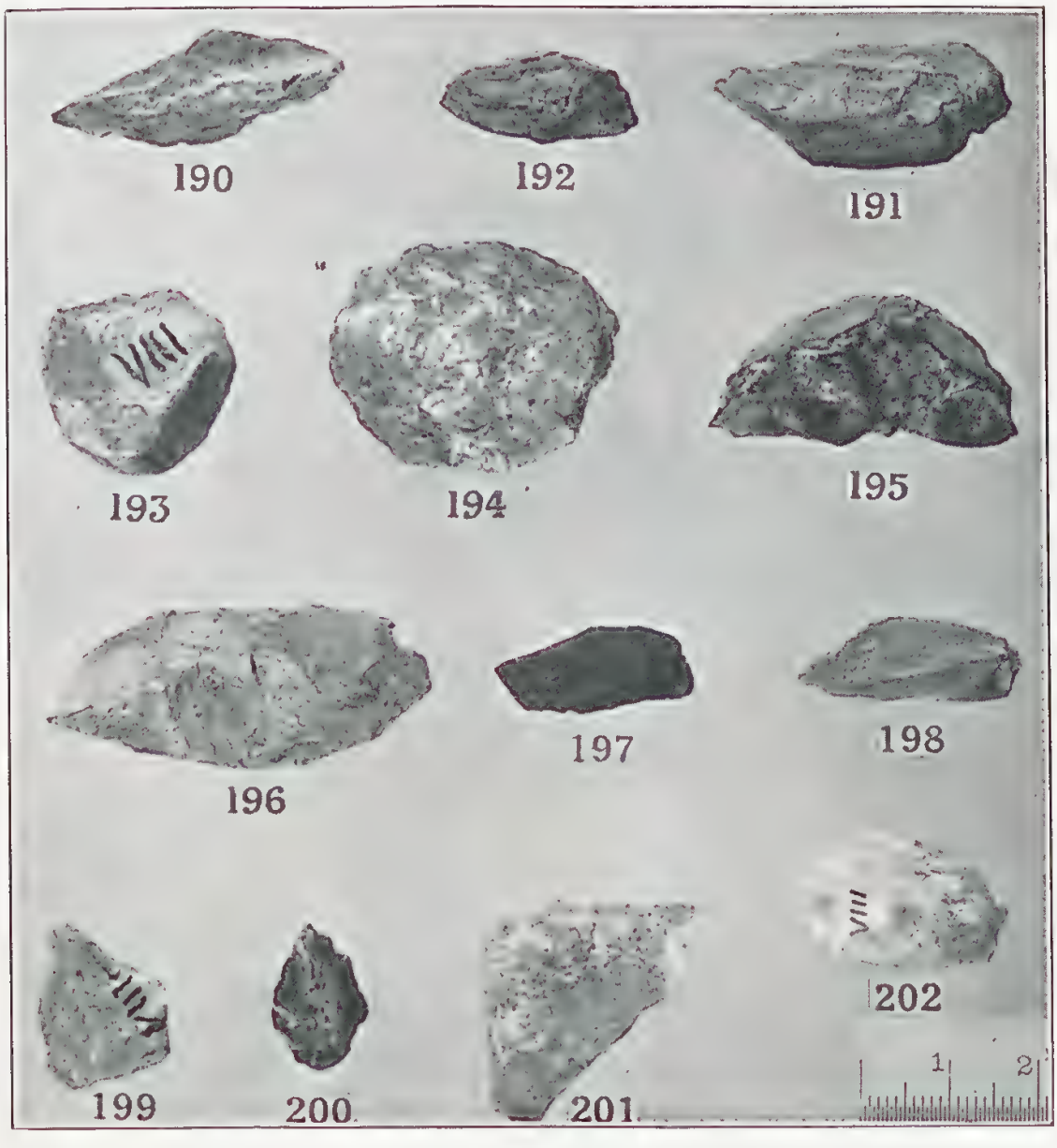

Fig. 190-202. "Pirrian" stone implements from Layer VIII, Devon Downs (nat. size).

214); (c) six split-bone points (figs. 206-211 and 225-226); (d) a small irregular bone chip, partly scraped and polished to a point (fig. 213); (e) a rough bone with numerous fine incisions on one face, and coarse cuts on one margin; this is perhaps a bone marked by the teeth of an animal, but it resembles the bone implement used as a compressor among some natives who practise pressure flaking (fig. 224).

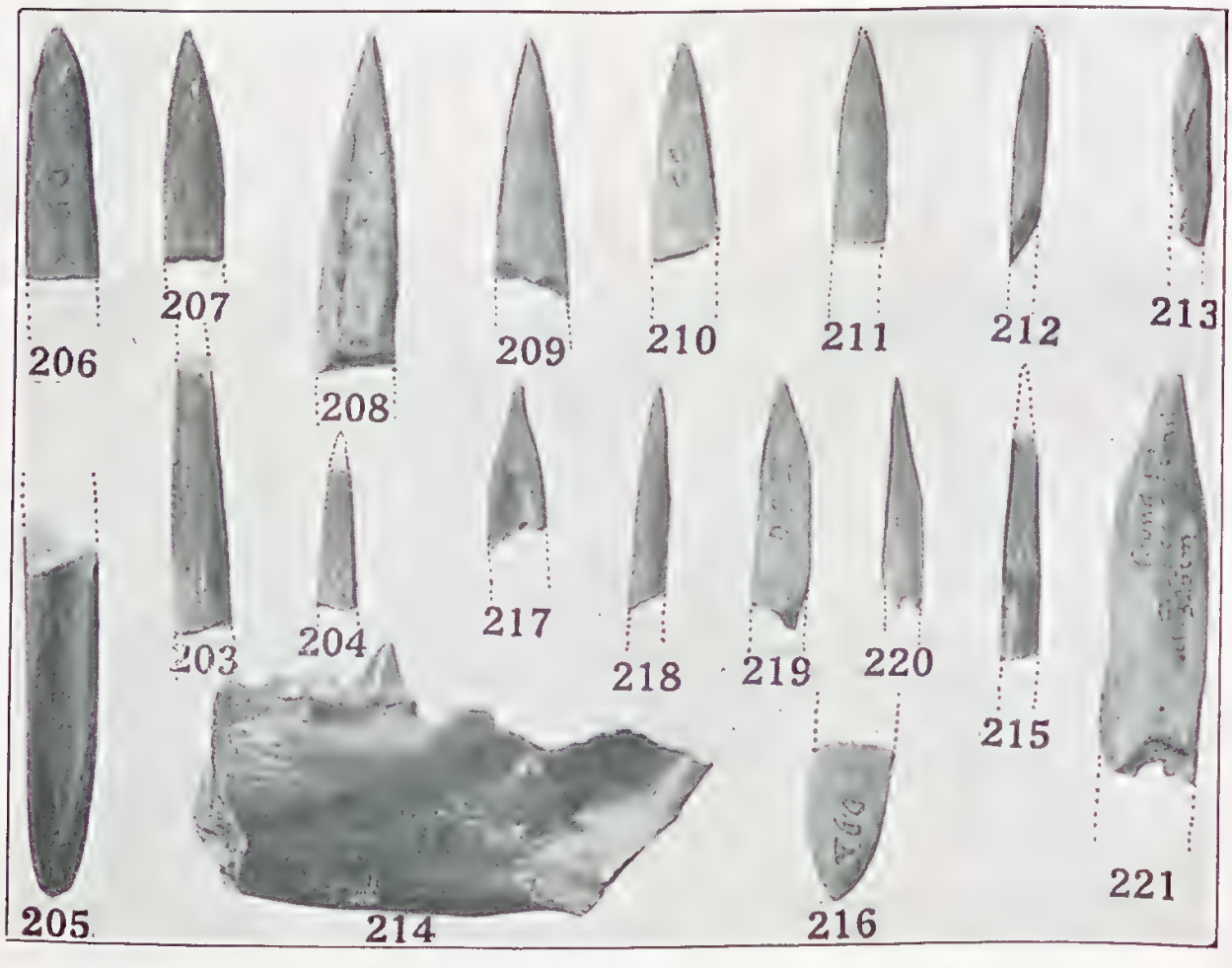

Fig. 203-221. "Pirrian" bone implements and portion of right ramus of jaw of *Sarcophilus* cf. *harrissi*, Layer IX (203-214) and Layer X (215-221), Devon Downs (nat. size).

Stone artefacts include nine *pirri* of white or grey chert (figs. 177, 179-182, and 240-241) and two of quartz (fig. 178); also one large crescentric implement (fig. 229) of dull grey chert, with a finely flaked convex margin. One elongate pebble hammer-stone of quartzite, only 4 cm. in length, with battered ends and sides, has a well-marked depression on one face.

Indefinite chippings include sixty-one of chert, almost all either white or grey, twelve of quartz and one core of white chert from which *pirri* may have been struck. No ochre was apparent, but a piece of pipe-clay was secured.

Layer X (Pirrian). The presence of a thin darker band and a slight change of colour of material assists in separating layers IX and X. Layer X is 20 to 25 cm. in thickness, and is largely composed of consolidated yellowish-grey material which breaks in large coherent lumps. Although this layer is only 1·7 metres above low river level it was dry. Much of the debris near the wall consists of sterile decomposed cliff, a shelf of which juts out and at the bottom of the level occupies the inner half of our excavation. This ledge is much reddened by fire, and in places the rock is thus affected for from 10 to 15 cm. from its face. Many burnt hearth-stones of cliff material were present. The animal debris is similar to that of the layer above. Several lenticular *Unio* hearths were present. In this and the lower layers charcoal is abundantly preserved.

MUSSELS: *Unio angasi, U. vittatus,* and *Corbicula angasi.*

UNIVALVES: *Bulinus texturatus, Paludina hanleyi,* and *Helix.*

FISHES: *Oligorus macquariensis* and *Tandanus tandanus.*

TORTOISE: *Chelodina* cf. *expansa.*

BIRDS: *Dromaeus novae-hollandiae,* and Ducks (spp. unknown).

MAMMALS: *Isoodon, Trichosurus, Bettongia, Lagorchestes* cf. *leporoides, Thylogale, Macropus* cf. *giganteus, Macropus, Hydromys* cf. *chrysogaster,* and *Rattus.*

The turtle bones from this layer, although fragmentary, exhibit differences from those of the turtles now living in the Lower River Murray. They were therefore referred to Mr. Heber A. Longman (Director of the Queensland Museum), who kindly examined them. He writes: "It seems to me that the fragments agree best with *Chelodina expansa,* especially in the extension of the border of the ischium to near the emargination of the plastron. The proximal moiety of the right humerus agrees fairly well in its contours with that of a medium-sized specimen of *Chelodina expansa.* It is unfortunate that the complete sutures of the intergular shield are not present."

ARTEFACTS: Parts of nine bone implements include: (a) portions of three round bones (fig. 215); (b) the bluff-pointed tip of a split bone implement (fig. 216); (c) five split bone points (figs. 217-220), three of which apparently have been formed from untrimmed splinters, and only the point bears indications of scraping or polishing (figs. 219-220).

Stone artefacts include ten chert *pirri* (figs. 230-239); two small chert scrapers, one irregular and the other crescentric; one large, irregular, rectangular, white chert scraper, with one concave worked edge; two microliths (a quartz disc and an irregular chert), and part of a quartzite hammer-stone.

Chippings comprise forty-five of chert, mostly dull yellow or grey, and four of quartz. Two pieces of pipe-clay were found, but no red ochre.

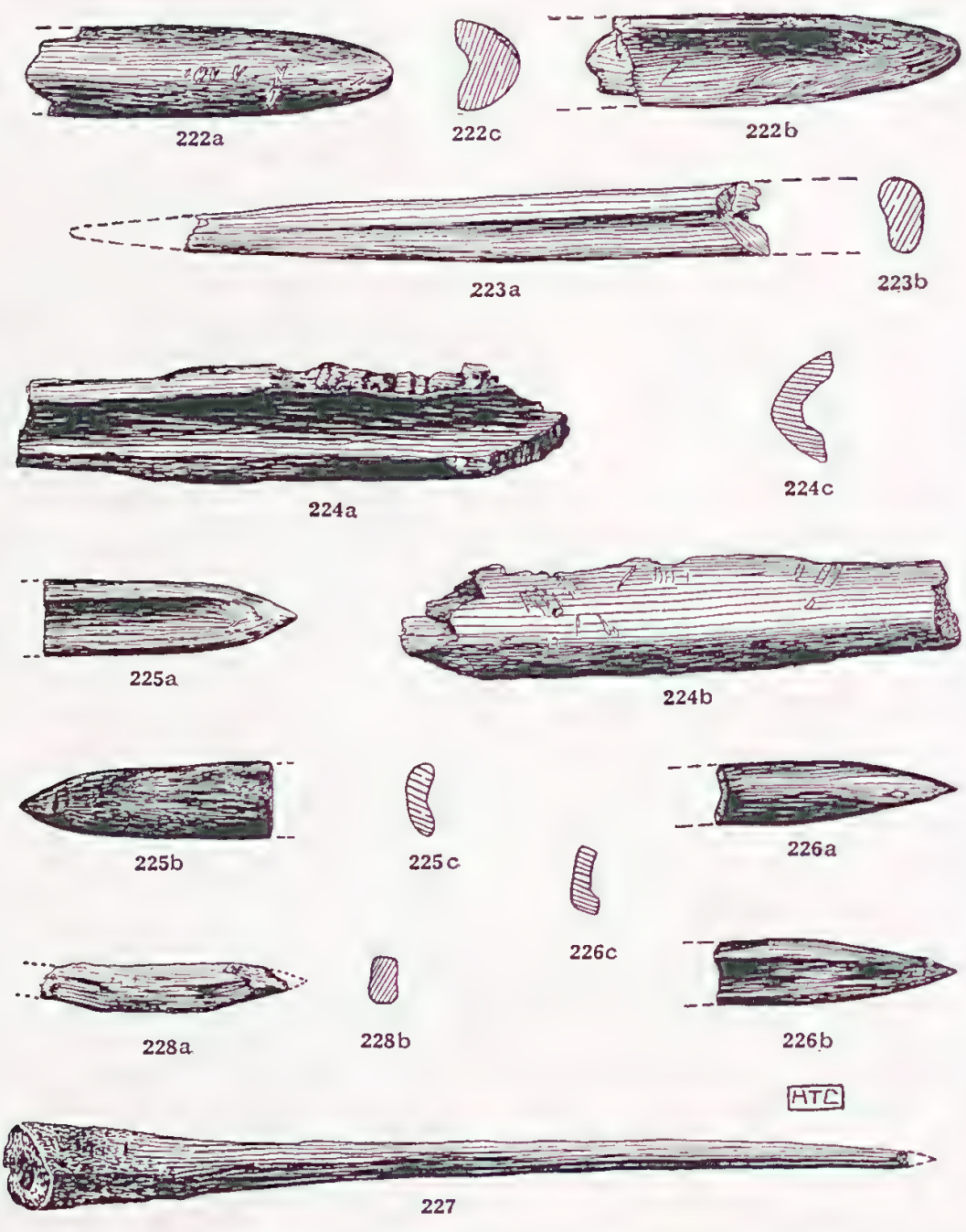

Fig. 222-228. "Pirrian" bone implements from Layer IX (222-226) and "Pre-Pirrian" examples from Layer XI (227-228), Devon Downs (nat. size).

Layer XI (Pre-Pirrian). Consists of a nearly horizontal layer, 30 cm. in thickness, which occupied only the northern half of the area of the excavation owing to the outward slope of the cliff here forming the floor of the shelter; thus the bulk of the material examined is much smaller than in other layers. The deposit is yellowish, somewhat earthy, consolidated, and dry, and contains much gritty cliff material.

Unio shell is relatively scarcer than in layer X; burnt pieces of cliff limestone and burnt limy concretions are more plentiful than in any other layer.

MUSSELS: *Unio* (many fragments, not determinable) and *Corbicula angasi.*

UNIVALVES: *Bulinus texturatus, Paludina hanleyi, Melania balonnensis,* and *Xanthomelon* cf. *eyrei.*

FISH: *Oligorus.*

TORTOISE: Not identifiable.

MAMMALS: *Trichosurus* cf. *vulpecula, Bettongia, Lagorchestes* cf. *leporoides, Macropus* cf. *giganteus,* and *Macropus.*

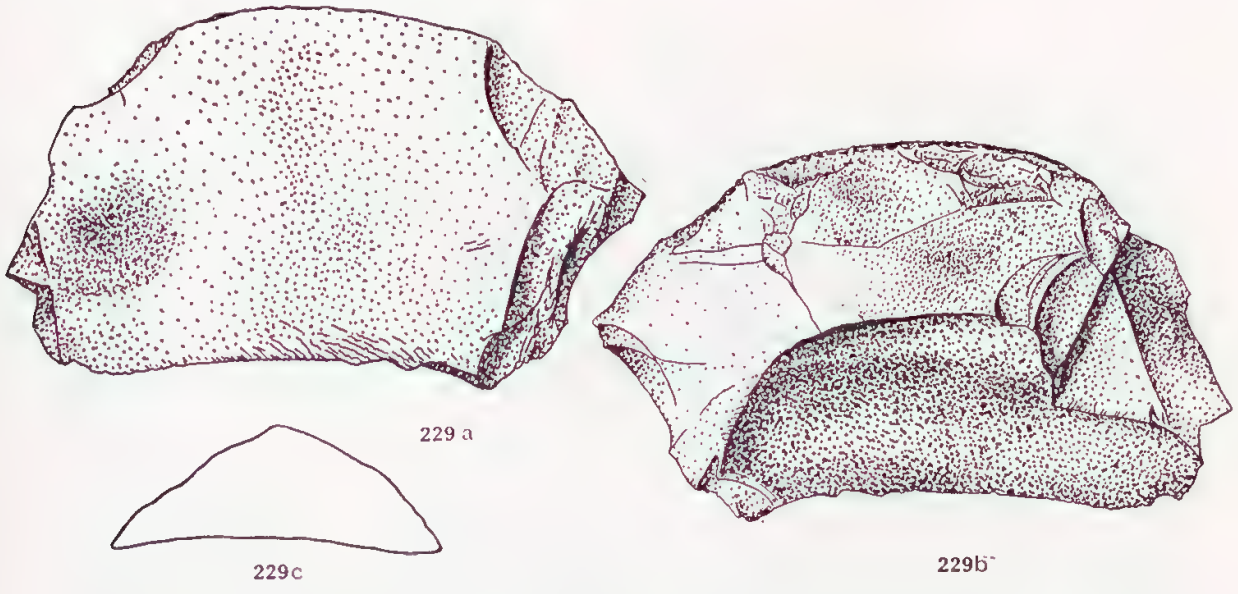

Fig. 229. "Pirrian" stone implement from Layer IX, Devon Downs (nat. size).

HUMAN REMAINS: A single very worn deciduous tooth; the crown portion of an upper left deciduous incisor. The crown has been large, but is considerably worn by attrition. The root has apparently been absorbed away, and only two or three millimetres of it remain.

ARTEFACTS: Bone implements are represented by an almost perfect example of an acute-pointed round bone (fig. 227) and by an irregular piece of split bone showing polishing marks (fig. 228).

No stone implements were present. A nondescript piece of chert exhibits doubtful retouch. Thirty-one chert chippings, and two of quartz were encountered, together with one piece of pipe-clay and two of red ochre.

Layer XII (Pre-Pirrian). Consists of a pocket of debris, of a maximum thickness of 55 cm., which occupied the outer third of the excavation and extended everywhere to the rock bottom. The material is earthy and dark in colour, and contains burnt stones, sparse *Unio* shell, and much charcoal. Rock boulders, many showing the effects of fire, were abundant. *Unio* and other

occupational detritus were found adhering to the floor of the shelter and in crevices in the rocky floor.

The bulk of deposit examined was relatively small; it is poor in occupational debris in comparison with the layers immediately above; it may be mentioned, however, that the portion of the floor of the shelter exposed by the excavation was rugged and uninviting as camping ground. If further excavations are undertaken it would be well to devote some time to the examination of this layer at a point further away from the wall; the general downward trend of the floor of the shelter is rapid, but that of the surface of the layer is gradual, indicating that a considerable outward extension of it may be expected.

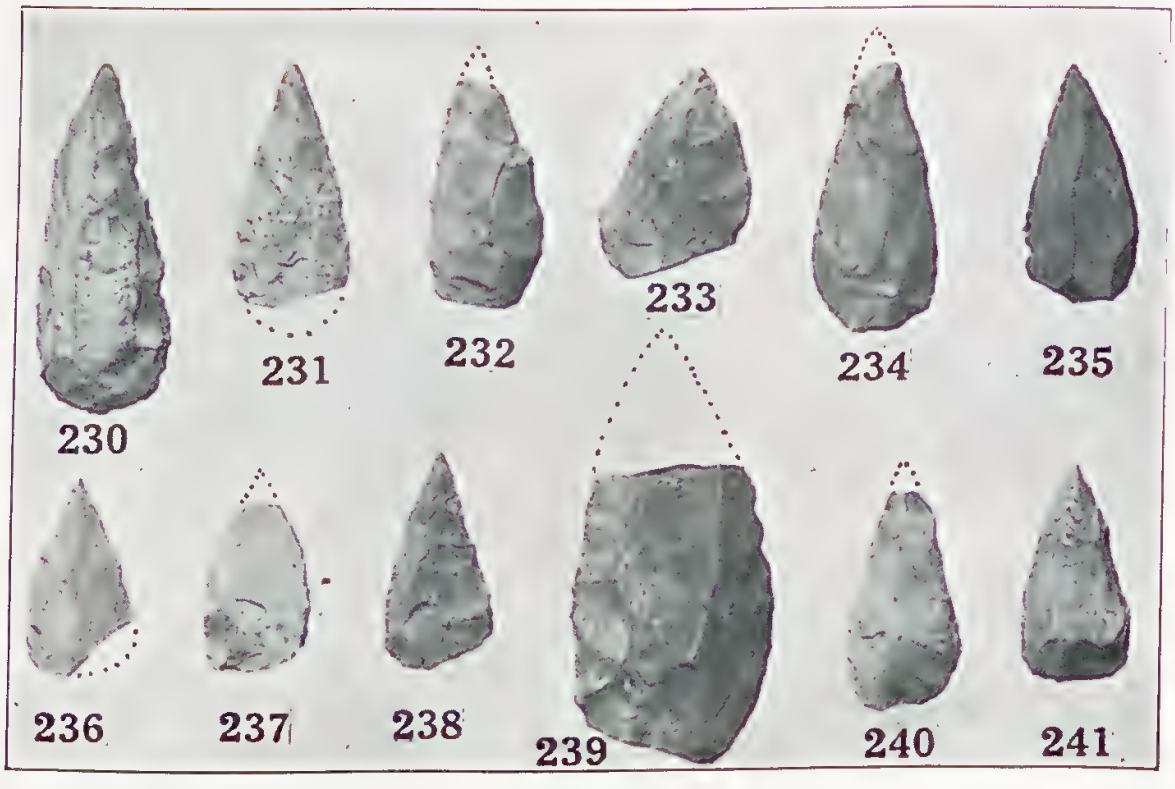

Fig. 230-241. "Pirrian" stone implements from Layers IX (240-241) and X (230-239), Devon Downs (nat. size).

MUSSELS: *Unio angasi, U. vittatus,* and *Corbicula angasi.*

UNIVALVES: *Bulinus texturatus, Paludina hanleyi,* and *Xanthomelon* cf. *eyrei.*

FISH: *Oligorus.*

TORTOISE: Unidentifiable fragments.

BIRDS: *Dromaeus novae-hollandiae* (vertebrae); unidentifiable bones of other birds.

MAMMALS: *Sarcophilus* (or ? *Canis*) (fragment of two-rooted tooth only), *Trichosurus* cf. *vulpecula*, *Hydromys* cf. *chrysogaster*, and *Rattus*.

ARTEFACTS: No implements, either of bone or of stone, were recovered.

Chippings included ten of chert and one of quartz. There was also a single piece of pipe-clay.

IV. DISCUSSION.

The transportation of stone by the natives is evident at both Tartanga and Devon Downs, because, with the exception of white and greyish cherts and the fossiliferous marine limestone and travertine, all of the stones are foreign to the localities. The nearest outcrops of Pre-Cambrian rocks are on the Rhine Creek, about four kilometres south-west. At Tartanga itself the fossiliferous limestone of the cliff is not found except when it has been transported there and utilized as hearth or oven stones, as evidenced by the burnt fragments occurring in strata B to E.

Cherts, phyllites, micaceous schist, quartzite, quartz, lamprophyre, and igneous rocks occur as burnt or broken fragments, hammer-stones or implements, at Tartanga; similar series have been found in the Devon Downs shelter.

SEQUENCE OF CULTURAL PHASES AT TARTANGA AND DEVON DOWNS.

A study of the results of the excavations at Tartanga and Devon Downs seems to show the presence of a sequence of cultures here termed (in ascending order) Tartangan, Pre-Pirrian, Pirrian, Mudukian, and Murundian, the first-named being separated from the others by a time lapse of unknown duration. The terms "Mudukian" and "Pirrian" are derived from the names of the typical implements represented, and the word "Murundian" from the local sub-tribal name of the latest occupants of the district.

Although the *muduk* was not found in the sparse occupational bands of layer V, the facies of the material recovered is similar to that from layers VI and VII (which contain the *muduk*) rather than to that from layers above it; it is therefore arbitrarily termed Mudukian herein. Layer V, and the brown horizon in layer IV may perhaps be regarded as transitional to the Murundian series.

This sequence of culture-phases from the Tartangan upward is conveniently shown in the following table:

CULTURE-PHASES.	SITE.	SALIENT FAUNA.	INDUSTRIES.
Tartangan	Tartanga beds A–E	*Unio protovittatus*	Stone and bone industry. Large patinated discoidal scrapers, coarsely retouched; coarse bone implements.
Pre-pirrian	Devon Downs XI–XII	*Bulinus* much more abundant than *Melania*. *Unio vittatus*	Scant bone industry; stone chippings, but no implements recovered. [Not well known.]
Pirrian	Devon Downs VIII to X	Large mammals common. *Sarcophilus cf. harrissi*. *Chelodina cf. expansa*. *Unio vittatus*	Rich stone and bone industry. *Tula* rare in upper and absent from lower layers. Leaf points *(pirri)* abundant; double-pointed bones *(muduk)* absent.
Mudukian	Devon Downs layers V to VII	Small mammals numerous. *Sarcophilus cf. harrissi*. *Unio vittatus*	Rich stone and bone industries including *tula* and double-pointed bones *(muduk)*. Rock markings, Type A.
Early Murundian	Devon Downs layers II to IV	All are existing species of animals. *Unio vittatus*	Degenerating stone industries; adze stones *(tula)* common only at beginning; bone artefacts very rare. Rock markings, Type B.
Late Murundian	Devon Downs layer I	All are existing species. *Unio vittatus*. *Melania* much more abundant than *Bulinus*	Degenerate stone culture. Rock markings, Type C.

It is difficult at present to define the relationship between the Tartangan material and that occurring in the cliff shelter, but, as already stated, there is a time-lapse, of unknown duration, between them. The Tartangan culture is more primitive than the Pirrian and succeeding cultures.

The "leaf-point" stone artefacts characteristic of layers VIII to X (figs. 176-189 and 230-241), and for which the name *pirri* is herein adopted, have long been known from old camp-sites in many parts of southern Australia, but their use amongst living tribes has not been observed. Horne and Aiston (1924, pp. 90-91, etc., and fig. 67) illustrate examples of this implement under the Wonkanguru name "*pirrie,*" regarding it as the forerunner of a simpler flake in use to-day; this less developed flake is fastened to a stick with gum and used as a drill (see also Brough Smyth, 1878, p. 380, fig. 200). Horne and Aiston write: "It is used as a graving tool . . . . and occasionally . . . . as a drill for light boring work. . . . . The art of making these seems to be lost among the tribes here, though one old man showed me how they were made by pressure. I have found hundreds that were beautifully chipped . . . . but those used by the blacks to-day are simply any sharp-pointed stone."

Thus it is evident that the elongate triangular implement with retouched edges and prepared butt is unknown among living Wonkanguru natives. It seems possible that this artefact may have been a spear-head; certainly it is typologically distinct from the modern flake-drill, and seems to have been fashioned entirely by hammer flaking, not by pressure. Nevertheless, it seems convenient to adopt the name applied by Horne and Aiston to the "leaf-flake" in order to avoid further confusion, and to regard the examples figured by them as typical.

The implements recovered seem to indicate that the people of Mudukian horizons were the last at Devon Downs to extensively utilize bone implements; most of the examples are smaller than those common in Pirrian and earlier layers. The "*muduk,*" or supposed fishing-bone, the most characteristic of these bone artefacts, apparently was not used by Murundian people; it has been found in Victoria, on sand-hummocks between Tower Hill and Port Fairy, and has been indirectly recorded by Brough Smyth (1878) from Geelong as having been used by natives within recent times. In the accompanying drawing (fig. 242) a line is shown attached to one of the *muduk* from Devon Downs in the manner illustrated by Brough Smyth; it is worthy of note that slight grooves are present on the edges of the bone where encircled by the string (compare figs. 111, 153, and 242, all illustrations of the same specimen).

Local native legends indicate that within tribal memory there has been a southward movement of peoples from up river; it would seem that, if this movement is linked with Murundian levels, the latest cultural phase has not extended to the coastal parts of eastern Victoria, where people of a somewhat earlier phase (possibly comparable with the Mudukian) existed until the present time. Additional evidence is necessary, however, before this theory can be defi-

nitely advanced, but the occurrence would perhaps be similar to the known replacement and absorption of the very primitive Wirrangu people of the West Coast of South Australia by the somewhat more advanced inland Kukata natives from the north, a movement which is still in progress.

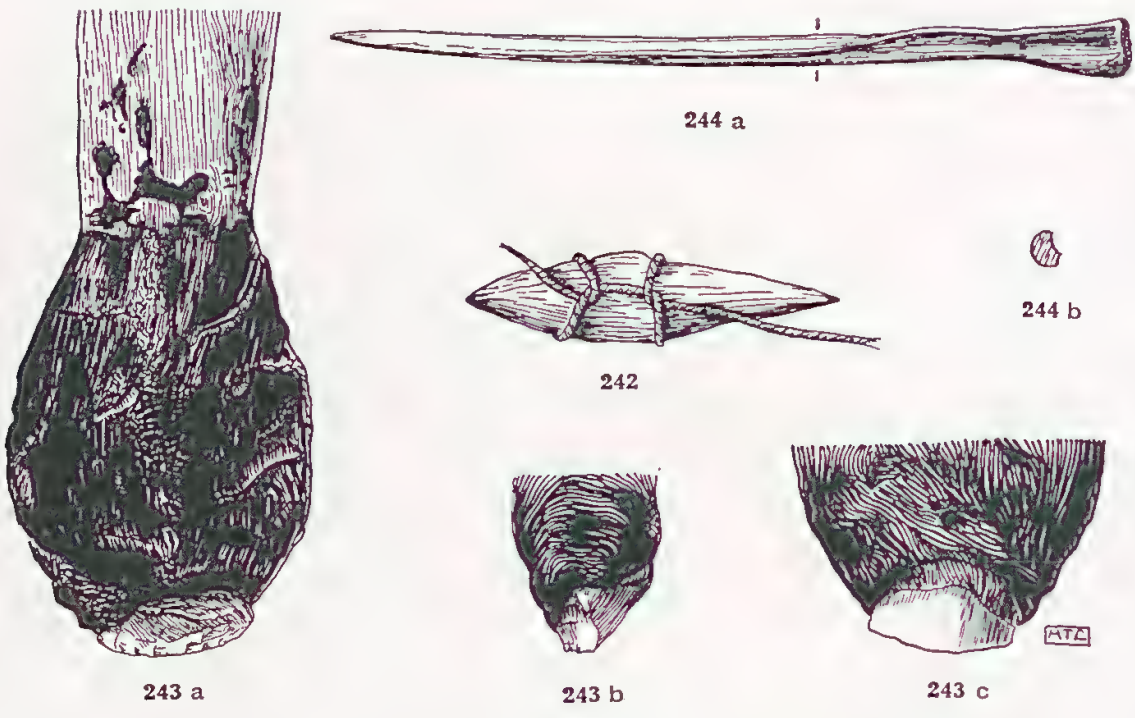

Fig. 242. "Fishing bone" showing line attached after the manner indicated by Brough Smyth.

Fig. 243. Extremity of adze showing method of mounting in gum, and wearing of stone "*tula*" (Gascoyne District, W. Aust., S.A.M., No. A 4283).

Fig. 244. Bone awl from Frew River, Central Australia, Arunta Tribe, S.A.M. No. A 11733 (nat. size).

The Murundian may be conveniently divided into an earlier and later phase. The latter is probably that of the aborigines who, until the advent of the white man, occupied the country from Rhine Creek northward to North-west Bend; the Devon Downs shelter is still occasionally used by the lingering remnants of the tribe. The principal objects of their culture, at the time of their first contact with Europeans, included the following: Polished basalt axes *(purra-turi)*, almost certainly traded from western Victoria and the south-east of South Australia (fig. 245); adzes *(narrupung)*, formed by fixing with gum a discoidal flint to the end of a stick 20 to 30 cm. in length. Wooden weapons comprised light spears *(kaiyur)* of tea-tree *(Leptospermum)* and reed *(Phragmites communis)*, which were thrown with a spear-thrower *(ngeweangko)*; small spears called *kaieko*, and heavy javelins; waddies *(purra)*, fighting sticks *(nakko)*, and long, double-edged, heavy sticks *(tadnannakko)*, and shields, both plain *(tar-*

ramo) and ornamented *(tayarukko)*. Climbing-sticks *(kailko)* were used for ascending red gum trees *(Eucalyptus rostrata)*, by driving them into the thick bark; they were also utilized, with or without stone axes, for cutting out elongate sheets of gum bark, from which canoes were made; the larger canoes were called *yungguilp*, smaller ones *manno*. Bags and baskets included the *puwotto*, or rush-basket, netted bags *(dlenko* and *rakko)*, food-bags *(nuingka)*, and bark dishes *(yepille)*.

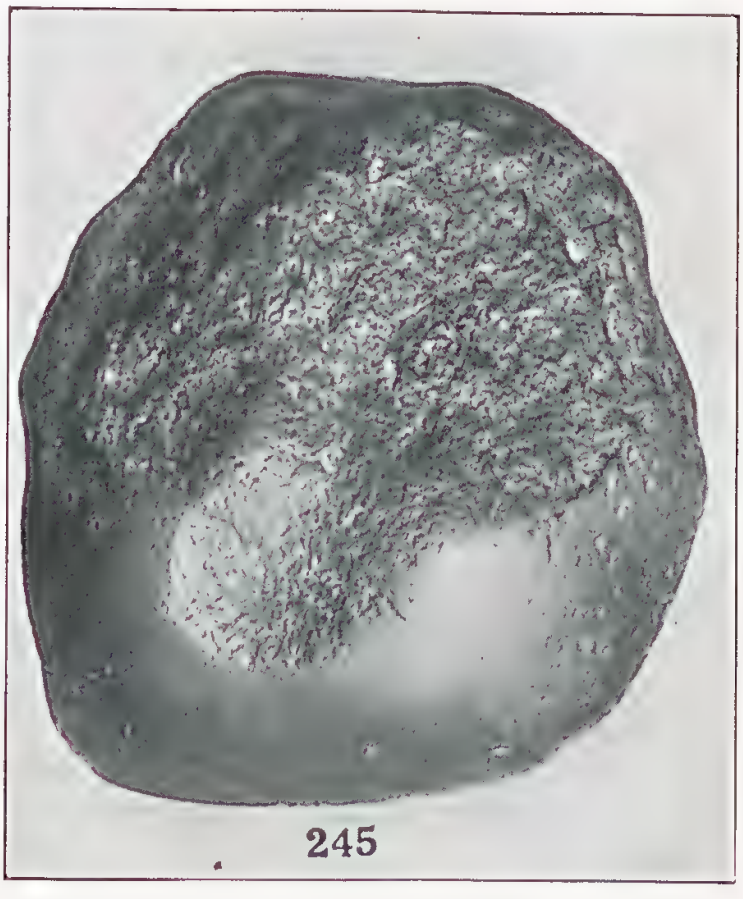

Fig. 245. Basalt axe head, Claypans, River Murray, S.A.M. No. A 14592 (nat. size).

Fish were caught in nets *(ratto)*, and ducks by other nets *(nongkun)* suspended between trees near the ends of lagoons. Spinning-sticks *(bakku* and *wirrilpi)* were used in the manufacture of strings for nets and for articles of dress such as hair girdles *(kerrerun)*. Fur-skin cloaks *(tionko)* were worn; stuffed skins were used as beating pads *(tapparingi)* during dancing. Nose-pegs *(rommun)* of bone and wood were made, and bone awls *(pudngutta)* fashioned from parts of tibiae of kangaroos and emus were utilized for the sewing of skins.

The adze *(marrupung)* mentioned above is recorded for the Murundi tribe on the authority of one observer (Moorhouse, 1846, p. 37). It seems probable

that the implements referred to herein as "*tula*" were "adze-stones" primarily mounted in gum in the well-known manner (fig. 243), but that when considerably reduced in size by continued retouch after wear they were used in the fingers as crescentic or "high-backed" scrapers. Evidence of continued use after reduction is perhaps furnished by examples with partly polished edges and face found in layer IV of the Devon Downs shelter (figs. 58-59). *Tula*, worn or otherwise, are but seldom found on camp-sites in the Murray Valley known to be of recent origin, and from the evidence of the shelter it is suggested that they had become almost obsolete before the advent of the first Europeans.

A half-caste native, 80 years of age, recently informed us that the "*marrupung*" was a polished stone axe, and that his people (on the lower River Murray) did not use adze-stones mounted on a stick.

Mr. F. Preiss, the owner of the land on which Tartanga is situated, states that after the big flood in 1917 he found a human skelton exposed on the river bank in the Upper Beds dealt with in this paper. It was buried in a flexed position, with the head to the west, and associated with it was a black stone polished axe-head, now in the possession of Mr. F. A. C. Bleeser.

The detritus left by the late Murundians in the top layer of the Devon Downs shelter furnishes only a limited view of their culture. For example, no wooden objects have survived even in this layer; a stick driven into the damp outer zone of the shelter debris by the authors became riddled by termites within six months, so it is evident that wooden implements would be speedily destroyed.

ROCK MARKINGS.

Apart from ornamentation on weapons, utensils, and the body, the only signs of art, and the only evidence which would survive, are furnished by rock-carvings and paintings; the last-named are at present known within the Murundian tribal area from Haylands, twelve kilometres to the north of Blanchetown (Sheard, 1928), but carvings have been found at Wongulla, Fromm's Landing, Swan Reach, etc. (Hale and Tindale, 1925, and Sheard, 1927 and 1928).

Scores of these carvings occur on the walls and roof of Devon Downs shelter. From time to time large sections of the roof and walls, bearing carvings, have fallen on to various layers in the rock shelter, thus exposing new surfaces for ornamentation.

The character and position of these markings suggest that they may be divided into three groups, namely:

Type A, characteristic of Layers V to VI, or earlier.

Type B, characteristic of Layers II to IV.

Type C, characteristic of Layer I.

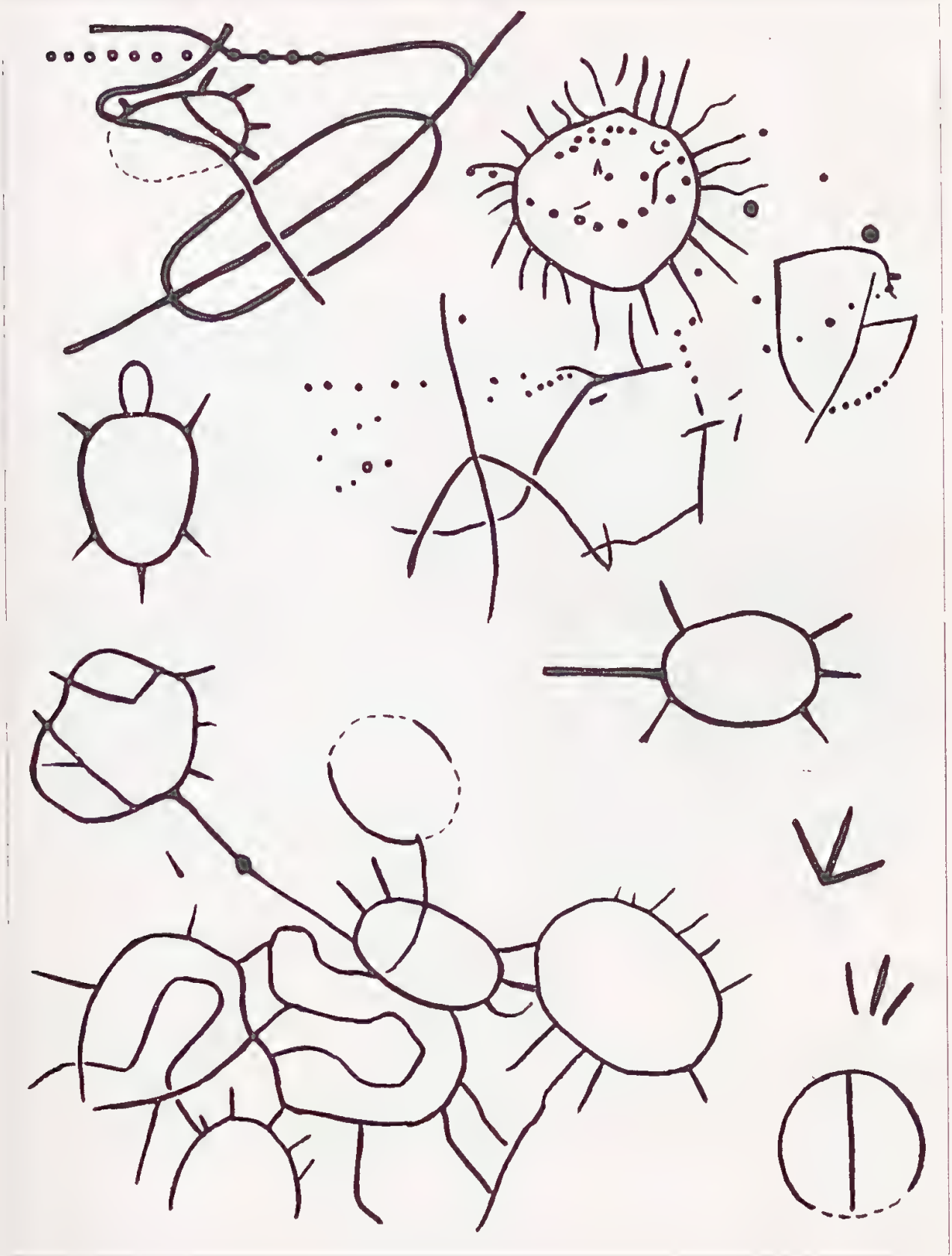

Fig. 246. Rock carvings (type B) from roof of shelter, Devon Downs.

Rock markings of type A are present only on the well-preserved rocky wall opposite layer V (fig. 66). They consist exclusively of "sharpening" marks similar to those which can be produced by rubbing a piece of bone against the rock. Some of them may have been made by the inhabitants of layer V, but others must have been produced before VI was deposited. They therefore seem to belong to the phase herein termed Mudukian. The markings in places occur in groups, radiating upwards from a common centre, suggesting a sequence of sharpening marks made by a single person.

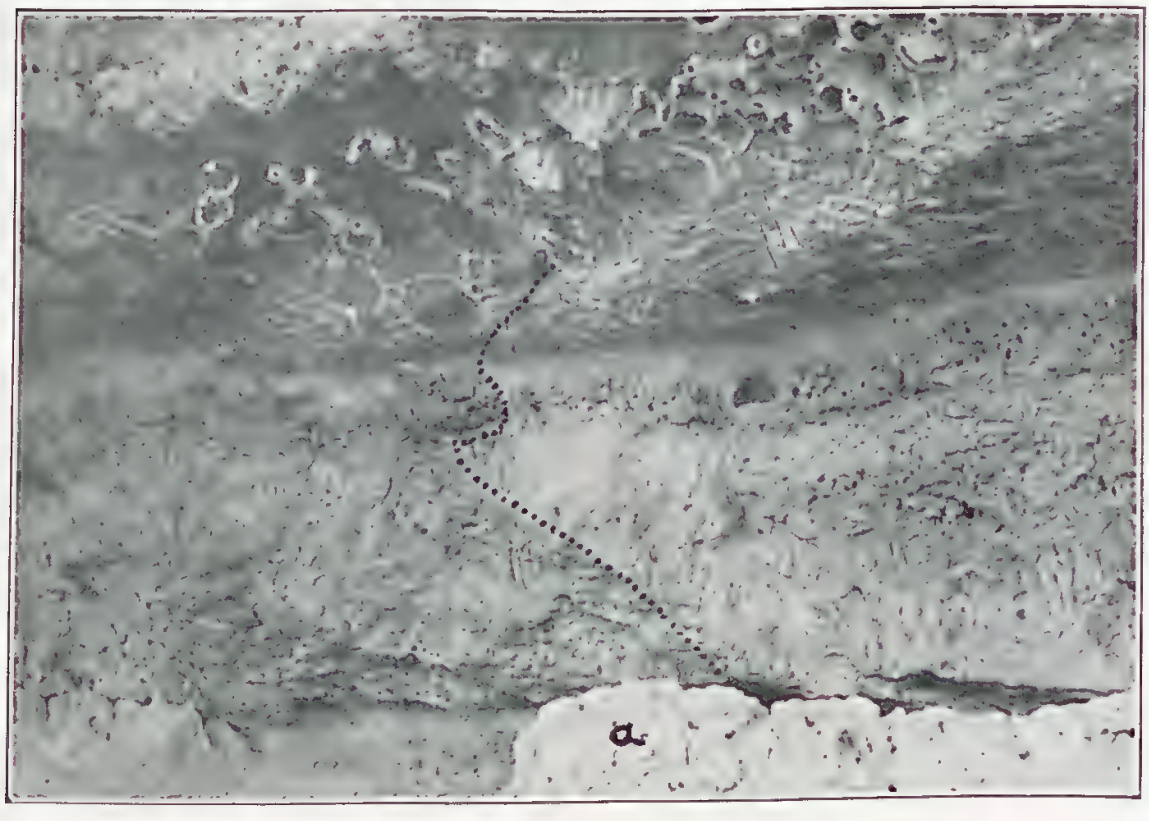

Fig. 247. Western corner of Devon Downs Shelter, showing carvings of type B (left) and type C (right); a indicates the rock fall from this wall on the right of the dotted line.

In the lowest layers of the shelter the faces of cliff and fallen boulders are so decomposed that they have not preserved markings, if such were present.

Carvings of type B consist of meandering lines of great length, tortoises, bird tracks, and "sun" designs, together with rows of small and larger holes such as could be made by rotating a firestick or a javelin with the butt against the rock (fig. 246). These carvings have been largely protected from atmospheric weathering by a thick carbonaceous deposit resulting from fires lit in the shelter. An early limit for the carvings of type B at Devon Downs is indicated by the rock which fell on to the uppermost level of layer V (see figs. 41, e, f, and 43, a), thus exposing part of the present roof of the shelter, upon

which markings of type B were subsequently carved. From land surfaces below layer II artificial aid to enable the artists to reach the roof would have been necessary for the execution of these carvings. On the soft rock of some parts of the back wall of the shelter, type B carvings are obscured by superimposed examples of type C, but elsewhere there is little superimposition.

The big rock which fell on to the uppermost level of layer II, in the western corner of the shelter (figs. 40 and 247, a), bears on its now lower face markings associated with meandering lines and tortoise figures of the same type as those on the roof and back wall immediately to the east of the place occupied by it (fig. 246). On the space cleared by this fall, however (fig. 247), are numerous markings of type C, newer in appearance, and consisting of straight-line markings and other designs, of which a composite series gathered from various faces in the shelter and on the cliff to the east and west are shown in fig. 248; the eight depicted at the top of the figure are from the space vacated by the rock-fall. Incidentally, knowledge of the occupational debris from Murundian levels was supplemented by the material excavated from beside and beneath this fallen rock; layers I to upper III were passed through during this excavation.

FOOD REMAINS AND FAUNAL CHANGES.

The only mammals of which recognizable remains have yet been obtained from the Tartangan beds are Opossum *(Trichosurus* cf. *vulpecula)* and Kangaroos *(Thylogale sp.* and *Macropus* cf. *giganteus);* concerning the latter Mr. H. H. Finlayson comments as follows: "The three fragmentary lower jaws each comprise the posterior third of the body of the ramus, minus the ascending portion; the latter having been broken away at the base of the coronoid. Three distinct individuals are represented, and the teeth include a right third molar, a right fourth molar, a broken third molar, and part of a right fourth molar. Several teeth were freed sufficiently from investing material and from cement, for accurate measurement."

"A right third molar has a length of 13 mm. and width of 7·5 mm. (anterior lobe). The mean values of these dimensions in a series of twelve *M. giganteus* are 13 mm. and 8 mm. A right fourth molar has a length of 14 mm. and a width of 10 mm., whereas the mean value for these dimensions in seven fourth lower molars of *M. giganteus* is 14·3 mm. and 8·4 mm. respectively. The fourth molar is different, therefore, in that its width exceeds by 18 per cent. the value characteristic of modern *M. giganteus,* and in fact is a millimetre wider than the largest fourth molar measured."

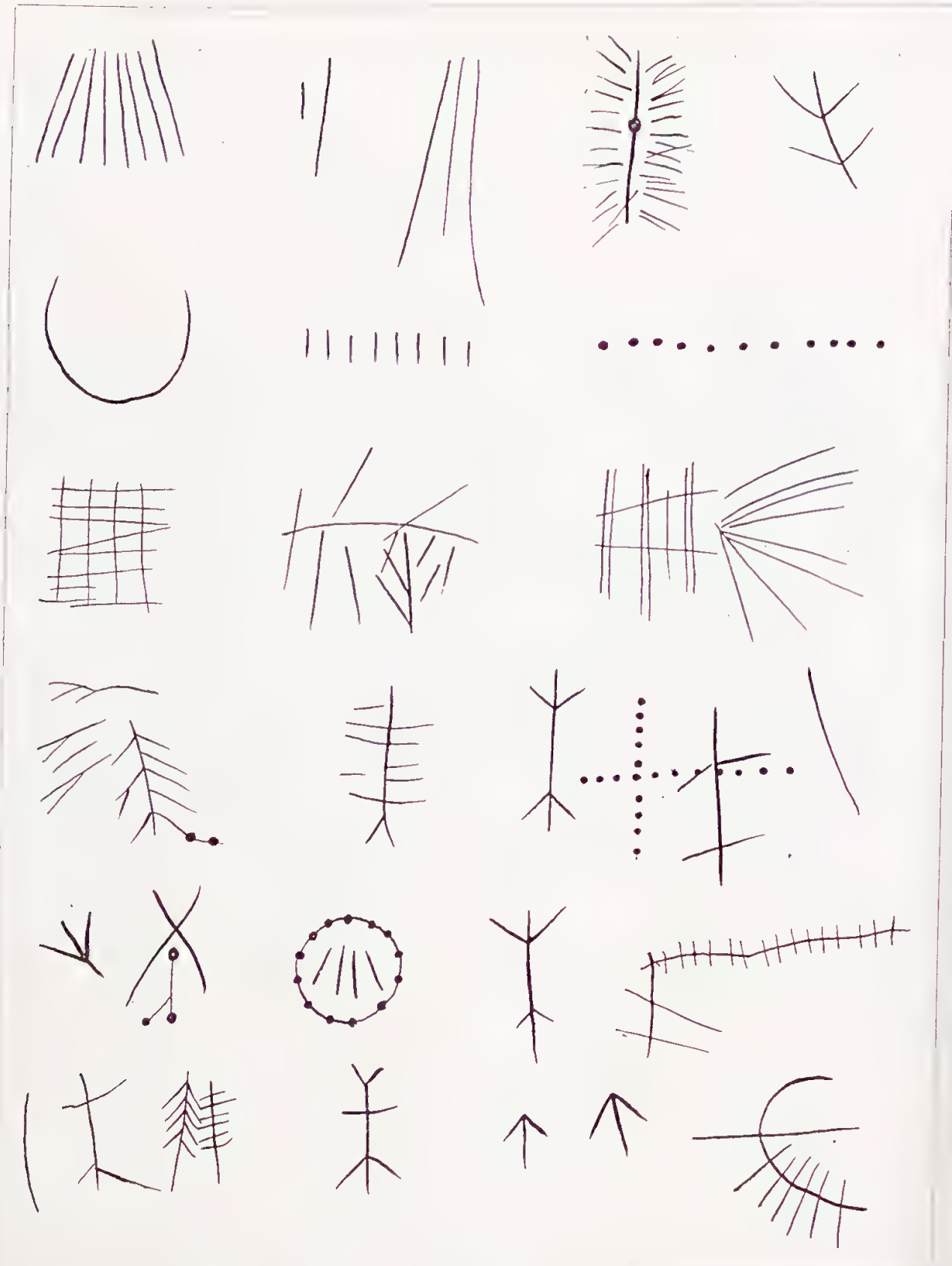

Fig. 248. Rock carvings (type C) from walls of shelter and adjacent cliff, Devon Downs.

The character of the animal food remains at various levels of the shelter, and at Tartanga, affords some indication of the habits of successive occupants.

The inhabitants of Tartangan times exploited river foods, such as fish, shells, and tortoises, although the presence of bone implements and the bones of some large animals prove that they were also hunters.

The Pirrian peoples were also well adjusted to a river environment. In early Mudukian times they were suddenly followed by people who apparently at first fed largely upon the small mammals of the plains, but nevertheless possessed the double-pointed fusiform fishing-bones (*"muduk"*). In later levels they seem to have become more adjusted to river conditions, and fresh-water foods play a much larger part in their diet. The assumption of the sudden appearance of these dwellers at Devon Downs is strengthened by the abrupt disappearance of the stone *"pirri,"* followed immediately by the arrival of the bone *"muduk,"* etc.

During the examination of the food debris of Devon Downs shelter all the specimens of *Melania, Bulinus,* and *Corbicula* in each layer were collected. These shells are of insignificant size, and doubtless were all carried incidentally to the place, and therefore may furnish an index of their relative abundance in the locality at different periods of time.

The accompanying graph (fig. 249), based on the vertical distribution of about a thousand examples, shows that in the lowest layers *Melania* is rare or practically absent; in later levels it tends to become more plentiful, and in layer I it is common. *Bulinus,* on the other hand, is plentiful in the lowest levels, but tends to decrease in number in the upper layers. *Corbicula* seems to have the same progressive tendency to decrease in abundance, as does *Bulinus.*

In reading the graph mental corrections must be made for the differences in thickness of the layers (indicated by the vertical columns), and therefore of the bulk of the debris from which the shells were taken. In the graph a correction has been made in the height of these columns to allow for the fact that only portions of the floor of the excavation were occupied by detritus in the cases of layers XI and XII.

It will be seen that if the above-mentioned correction is made *Bulinus* is 115 times more abundant in XII than it is in the same bulk of material from layer I. It may be remarked that *Bulinus* has a thin, fragile shell, which would not tend to preserve as well as the rugose, thick shell of *Melania.*

Melania is stated to be sometimes indicative of brackish water conditions, whereas *Bulinus* is a fresh-water dweller (Watts, 1905). Thus the graph suggests that during the period of deposition of the material in the shelter there has been a progressive modification in environmental conditions due to climatic changes in the direction of the semi-arid conditions of the lower watershed characteristic of the present time.

With the exception of some mussels *(Unio* cf. *stuarti)* from layer III, the *Unio* fauna varied little in all layers of the shelter; in lower layers they were much decomposed, and broke readily on being disturbed. All the examples of *U. angasi* and *U. vittatus* examined were thin-shelled.

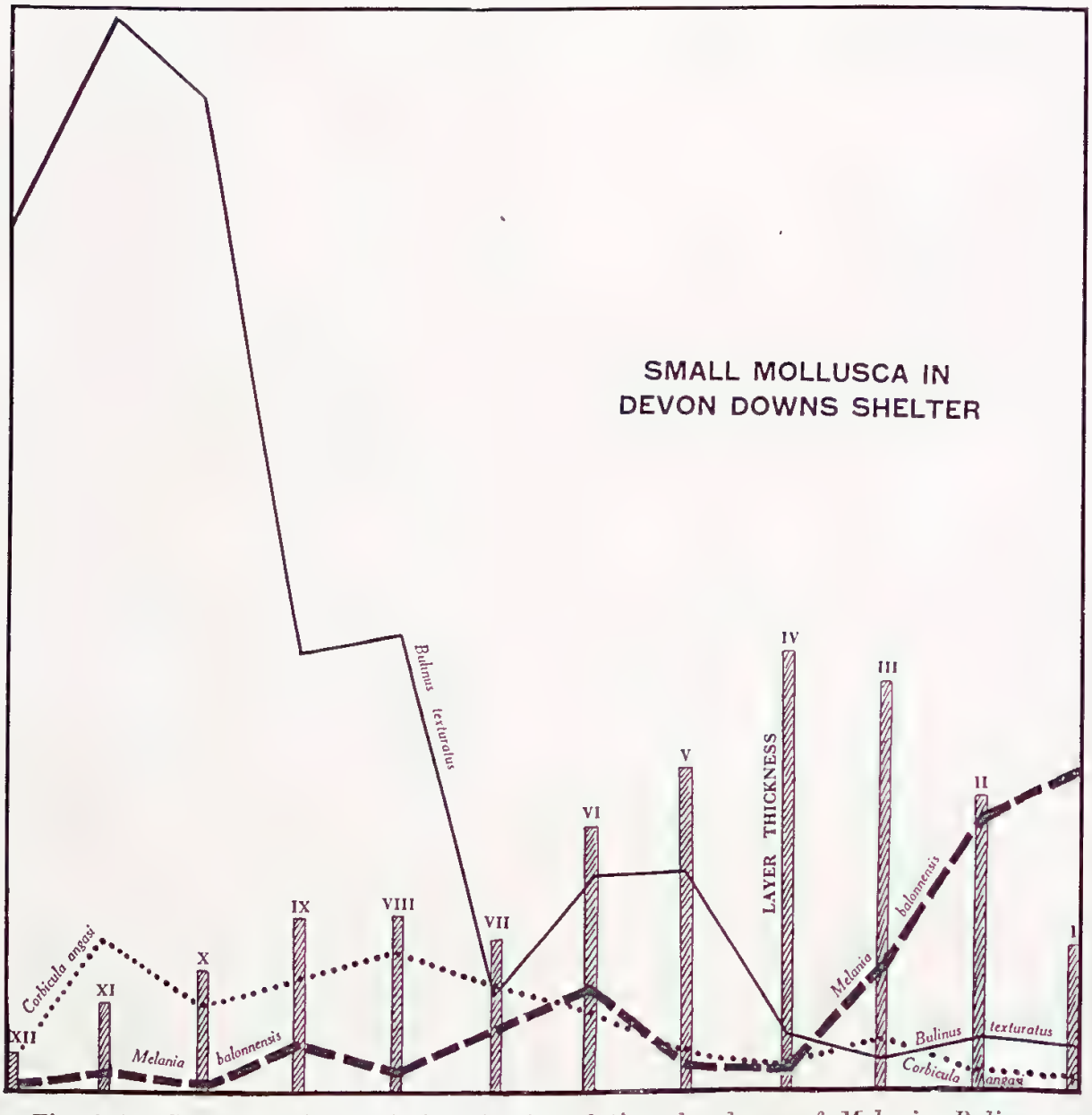

Fig. 249. Graph showing variations in the relative abundance of *Melania, Bulinus,* and *Corbicula* during the deposition of occupational debris in Devon Downs Shelter. (The curves have not been corrected for differences in the thickness of the layers.)

In Pirrian times *Paludina* was apparently used as food, for it is only in these levels that very large as well as the young shells occur. In all other levels by far the greatest number are the juvenile examples.

Some other faunal changes are indicated by the presence in layer X of a turtle which differs from all the species at present known from the Murray

River, but apparently closely approaches *Chelodina expansa*, a species hitherto recorded only from northern Australia. The occurrence of bones of *Sarcophilus* in and below layer VI is notable. *Sarcophilus* has never been found alive in South Australia; indeed, its presence on the Australian mainland in modern times is not yet fully established, although Kershaw (1912) has brought forward some circumstantial evidence regarding the capture of a living specimen at Tooborac, 63 miles from Melbourne, but left the question open as to whether it was an indigene or a Tasmanian example which had escaped from captivity.

HUMAN REMAINS.

Tartanga. A full discussion of the relationship of the Tartangan human remains must await detailed study. The material at present available suggests that they may be those of representatives of an early form of the Australian race, serving to link the problematical Talgai remains (of supposed Pleistocene Age) with the present-day natives of the south coast of South Australia.

The maxilla-alveolar breadth of Tartanga i is the same as that of Talgai, but the length is about 5 mm. less, chiefly owing to a reduction in the region anterior to the molars. The estimated area of the palate of Tartanga i youth (3,600) is conservative, and would have been somewhat increased had the individual attained maturity. Nevertheless, this area is one which in recent Australians is only attained by adult males of exceptional dimensions. The maxilla fragment of Tartanga ii indicates that this second individual had a smaller palate.

With the exceptions noted by Campbell, the teeth of Tartanga i and Tartanga ii are above the average for individual Australian teeth; this feature is particularly marked in the case of the incisors and to a lesser extent in the canines. The exceptional teeth are the upper third molars, which are, as in Talgai, of less than average dimensions. The crenation of these teeth is also more marked than is usual in Australian natives.

Other comparisons with the Talgai remains are only possible in general terms, because of the crushed condition of the latter. The individuals are not adult, and in Tartanga i (as in Talgai) the frontal development is not great. The proportions of the upper face, as far as can be judged at present, are different. The length-breadth index of Talgai, as estimated, is close to that of Tartanga i, but the ear-bregma height is less.

The mode of burial of the Tartangan people can be surmised from an examination of the strikingly similar positions of the skeletons of Tartanga i and Tartanga iii. It seems probable that the bodies were placed in their shallow graves, lying on their backs in an extended position, with one arm flexed so that

the hand was resting on a breast or shoulder, and the other arm lying close to the side, and, particularly in the case of Tartanga iii (fig. 19), with the hand covering the genitals.

The presence of portion of what is probably a bone implement in the palatal region of Tartanga i raises the query as to whether it was placed there at the time of burial or whether it was instrumental in bringing about the death of the youth. Other bone implements were lying beside and beneath the head, and it is suggested that their presence may have been of ceremonial import. The absence of the lower jaw also may have a similar significance.

The disassociated condition and position of the fragmentary remains of Tartanga ii which were recovered suggest that this skeleton was partly disturbed and broken by the excavators of the grave of Tartanga i. This disturbance took place before the bones became mineralized, as is indicated by the fact that the maxilla fragment, which was apparently left in the D bed undisturbed, shows the characteristic staining, etc., of remains from that horizon, whereas the lower jaw, which was replaced at a somewhat higher level, seems to be stained more like bones from bed E.

Devon Downs. All the human remains so far recovered from Devon Downs shelter are those of infants, and several types of burial are apparent. With the exception of a single tooth in layer XI, and a Mudukian child burial in layer VI, which was disturbed in early Murundian times, all the remains belong to the Murundian period. The condition of the oldest Murundian remains (the burial from the "brown level" of layer IV) suggests that the bones were interred after decomposition of the flesh; notable features in this case are the remarkable depth of the grave and the fact that it passed through a consolidated layer, broken portions of which were used to form a protection around the bones.

As described, the child in layer III was evidently placed in an unfilled chamber formed of masses of limestone, and the association of bones was complete, indicating burial in the flesh. Dr. T. D. Campbell writes: "The teeth of this and the preceding child constitute the most notable of all the human material secured from the shelter. In the child from layer III the teeth are very large, and considerably exceed the average dimensions given (Black) for the deciduous dentition of Europeans. The form of the teeth, particularly the upper central incisors and the four canines, presents simian characteristics. All the deciduous canines are of such a shape and in such a position in the arch relative to their neighbours that they project beyond the level of the other teeth and interlock in a fashion suggestive of the usual simian condition; these features are also characteristic of the dentition of the child from layer IV, and both are striking examples of the persistence of markedly primitive conditions in recent members of the Australian race."

The baby in layer II was partly disturbed before notes could be taken, but apparently was also buried shortly after death.

In 1927 Sheard, Mountford, and Hackett described the desiccated remains of a child, preserved under entirely different conditions, at Fromm's Landing, a few kilometres to the south. A white quartzite leaf-point of the type characteristic of Pirrian levels at Devon Downs was discovered in the wrappings of this specimen. Its presence suggests the possibility of the remains belonging to the Pirrian period. This desiccated child, in its grass and kangaroo skin wrappings, may well have been preserved for a considerable time in the high and well-protected rocky hollow in which it was placed, where it was isolated from contact with moisture or earth. Further, it was protected and sealed down by a thick, consolidated covering of animal excreta.

ACKNOWLEDGMENTS.

As already mentioned, Mr. W. R. Roy, of New Devon Downs, drew attention to the occurrence of human remains at Tartanga, and the credit of the initial discovery is due to him. For ready permission to camp and excavate on their properties our thanks are due to Messrs. F. Preiss and C. G. Herrmann, respective owners of the sections on which Tartanga and Devon Downs shelter are situated.

Drs. C. Fenner and T. D. Campbell visited the sites concerned on May 26, 1929, examined Tartanga, No. i, *in situ*, and inspected all other data then available; we are indebted to Dr. Fenner for much information and advice, especially on matters relating to the physiography of this part of the Lower Murray Valley, and to Dr. Campbell, who herein briefly describes the dentitions of the human material, reserving a detailed account for subsequent publication.

Among others who examined the evidence at Tartanga and Devon Downs were Messrs. H. L. Sheard and F. J. Hall; during the inspection the former discovered the remarkable bone implement shown in fig. 24.

For the examination and identification of much of the abundant but largely fragmentary animal remains we have to thank Mr. H. H. Finlayson (mammals), Dr. A. M. Morgan and Mr. J. Sutton (birds), Messrs. H. Longman and J. R. Kinghorn (a turtle), and Mr. B. Cotton (molluses). Professor J. A. Prescott kindly tested soil samples, and Mr. A. R. Alderman extended assistance in the identification of rocks.

Mr. J. Rau (Taxidermist in this Museum) treated and assembled the fragments of human skulls, and we herewith express our high appreciation of the painstaking and efficient manner in which he has carried out this tedious work.

Messrs. B. Cotton (Assistant Conchologist) and J. Conroy and H. Condon

(Museum Assistants) co-operated heartily as our field companions; and the last-named is responsible for the illustrations bearing his initials.

V. SUMMARY.

At Tartanga there are human remains associated with food debris and an old culture. Geological and physiographical features show that these occupational records are at least of some antiquity.

At Devon Downs, nearby, is a shelter younger than the Tartanga site; it contains well-stratified occupational debris six metres in depth, which furnishes indications of the influence of four cultural phases. The animal remains suggest that faunal modifications, possibly due to climatic variations, have occurred.

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FISSURELLIDAE FROM THE "FLINDERSIAN" REGION, SOUTHERN AUSTRALIA.

By BERNARD C. COTTON, South Australian Museum.

Figs. 1-3.

In 1903 Hedley proposed a division of the Australian coast into four faunal regions, which he named Solanderian, Dampierian, Adelaidean, and Peronian.(1)

The "Adelaidean" region extends from Wilson's Promontory, Victoria, to Sharks Bay, Western Australia; the term suggests an area around Adelaide, and seems too localized in meaning for a faunal area extending over nearly all the southern and half the western coasts of Australia. Further, with the exception of the "Adelaidean," the faunal areas are named after famous men connected with Australian history. It is proposed, therefore, to hereafter substitute for it the term "Flindersian."

Diodora lincolnensis sp. nov.

Shell ovate, wider posteriorly, elevated, conical. Length, 41 mm.; width at middle, 29·2 mm.; height, 18 mm. Length of posterior slope from posterior margin to centre of perforation, 29 mm. Posterior slope convex, anterior

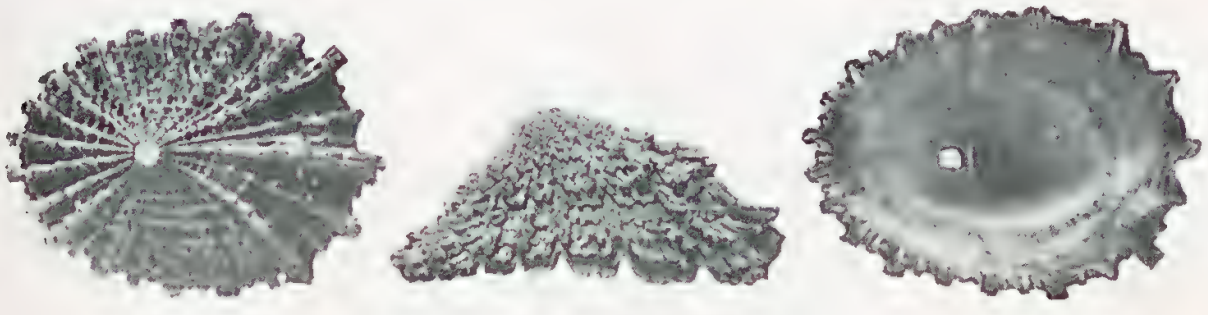

Fig. 1. *Diodora lincolnensis* sp. nov.

slightly concave. Perforation rectangular, 2·5 mm. long and 2 mm. wide. Internal callus surrounding the perforation, truncate posteriorly. Sculpture consists of eighteen prominent radials, larger posteriorly, with one smaller interstitial between the 12 anterior, and two between the posterior. Eighteen concentric laminae cross the radials, forming beautiful, digitate scales at the

(1) Proc. Linn. Soc., N.S.W., 1903, pt. 4, p. 880.

intersections. The radials show corresponding weak depressions internally. Ground colour yellowish, radials tinged with brown, and the depressions caused by the latticed sculpture blue.

Type. Port Lincoln, South Australia. In the South Australian Museum (D. 9753).

The radula, formula ∝1.4.1.4.1.∝ consists of a wide central tooth (A), set obliquely on the radula. Four very narrow laterals (B). One large major lateral (C), having two cusps, the under and larger much stronger than the upper. An indefinite number of very narrow marginals (D), attached to a base which is apparently folded. The various teeth are drawn separated in the illustration in order to show their individual shape distinctly.

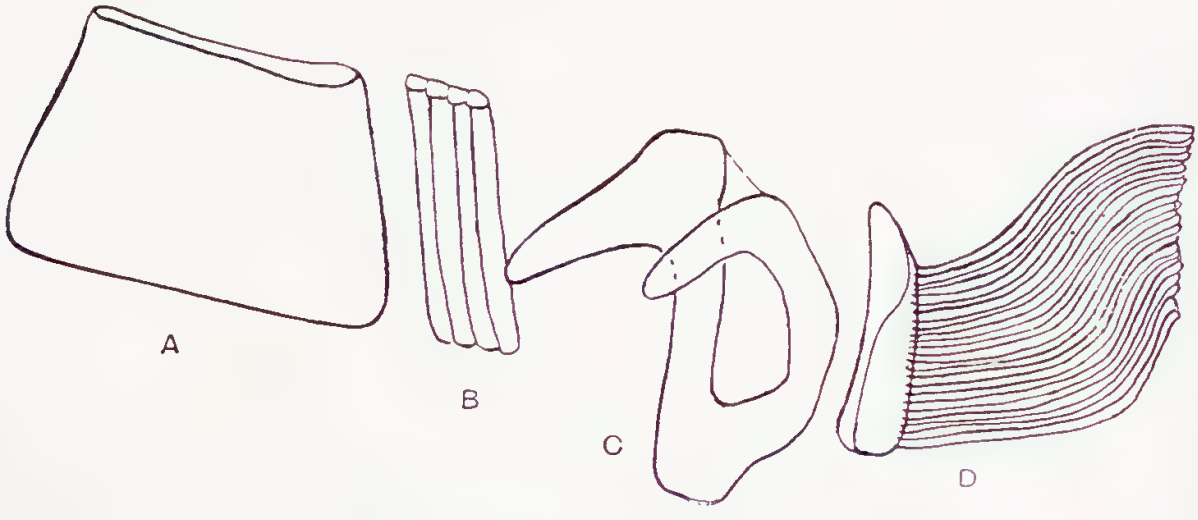

Fig. 2. Radula of *Diodora lincolnensis* sp. nov. (200 ×.)

Loc. Newland Head, 20 fathoms; Backstairs Passage, 13 fathoms; Brighton; Investigator Strait, 15 fathoms; Corney Point; Port Lincoln; Laura Bay; Murat Bay; Albany; Yallingup; Bunbury, 22 fathoms.

A large beach-worn specimen from Port Lincoln measures 60 mm. long, 40 mm. wide, and 25 mm. high. This shell somewhat resembles the Queensland shell *F. jukesi* Reeve, but is far more validly sculptured.

ELIGIDION OCCIDUUS sp. nov.

Shell ovate, elevated, conical. Length, 27 mm.; width at middle, 19·5 mm.; height, 13·3 mm. Length of posterior slope from posterior margin to centre of perforation, 17·5 mm. Posterior slope convex, anterior almost straight. Perforation rectangular, slightly rounded posteriorly, 2·2 mm. long and 1·4 mm. wide. Internal callus surrounding perforation not truncate posteriorly. There are about sixteen primary radials; between these, at varying distances from the

perforation, about sixteen secondaries, and at a still further distance between some of these, tertiary radials form, raising the total number to fifty-five. Seventeen concentric laminae cross the radials, forming prominent scales at the intersections. At and inside the margin are notches corresponding with the external ribs. Colour greyish-green externally, but this may not be its colour in life. White internally, with a blue band surrounding the perforation.

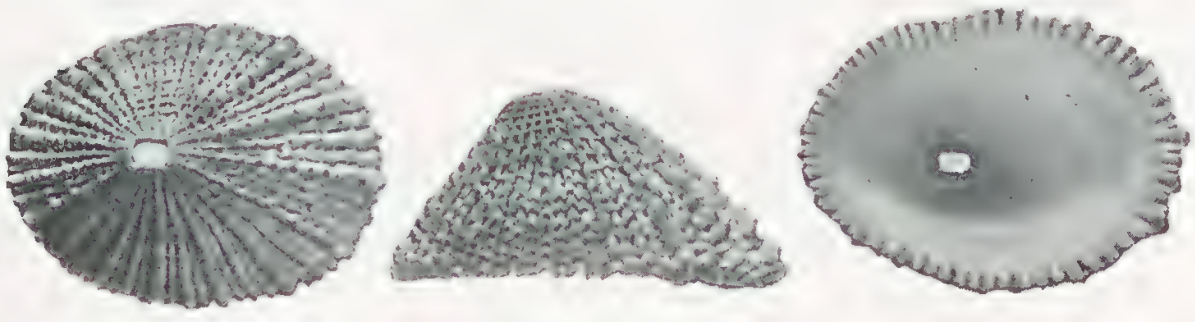

Fig. 3. *Eligidion occiduus* sp. nov.

Type. Shark Bay, West Australia. In the South Australian Museum (D. 9772).

The type was found by Mr. Edwin Ashby. The absence of truncation of the internal callus of the perforation locates this species in the genus *Eligidion*. The type species, *E. audax*, is more depressed, has fewer, more widely spaced, latticed and unscaled radials.

This shell comes from a critical locality. In Sir Joseph Verco's collection of *Fissurellidae* from South and south Western Australia, many genera and species occur, but not one example of this form. It is therefore probably a Dampierian species.

EMARGINULA SUPERBA PATULA subsp. nov.

In this Flindersian subspecies the alternate large ribs are white from apex to margin, and separated by one large and two small pinkish-brown coloured ribs. The margin spreads more than in *E. superba* Hedley, being widest at the lateral line of the apex, and it is more attenuate anteriorly.

Type. Beachport, 200 fathoms. 19·3 mm. long, 14 mm. wide, 5·6 mm. high. In South Australian Museum (D. 9725).

Loc. Beachport to Fremantle, down to 200 fathoms.

EMARGINULA CONVEXA FLINDERSI subsp. nov.

South Australian specimens are a little larger than the Queensland *E. convexa*, which are narrower and less spreading in the adult.

Type. Cape Jaffa, 130 fathoms. 3·5 mm. long, 2·7 mm. wide, 1·7mm. high. In South Australian Museum (D. 10124).

Loc. Beachport to Cape Jaffa, 130 to 150 fathoms.

MACROCHISMA TASMANIAE ROSEORADIATA Ten. Woods.

Two specimens from St. Francis Island are cream coloured with fourteen and seventeen red radials. They are slightly less solid than the typical *M. tasmaniae,* and the fissure is regularly oval, not narrowing towards the apex of the shell, as in that species.

Loc. St. Francis Island.

FISSURISEPTA FUMARIUM Hedley *(Puncturella).*

This species has the apex absorbed in the adult, a pecularity which distinguishes it from *Puncturella.* It should therefore be placed in *Fissurisepta*, the type of which is *F. papillosa* Seguenza.

Loc. 100 fathoms, 40 miles south of Cape Wills.

PELECYPODA OF THE "FLINDERSIAN" REGION, SOUTHERN AUSTRALIA.

No. 1.

By BERNARD C. COTTON, South Australian Museum.

Figs. 1-15.

Sir Joseph Verco's extensive dredging operations in South and Western Australia provided the material upon which this, the author's first paper on the Flindersian Pelecypoda, is based.

Protonucula gen. nov.

This genus is proposed for *P. verconis* sp. nov., described below. While resembling *Pronucula* in shape, it differs in having the anterior and posterior teeth meeting below the umbo and forming one series, and no chondrophore.

Protonucula verconis sp. nov.

Shell oval, thin, polished, concentrically lirate; umbos fairly prominent; the anterior and posterior teeth form an unbroken series; they attain the maximum size about the middle of the anterior set.

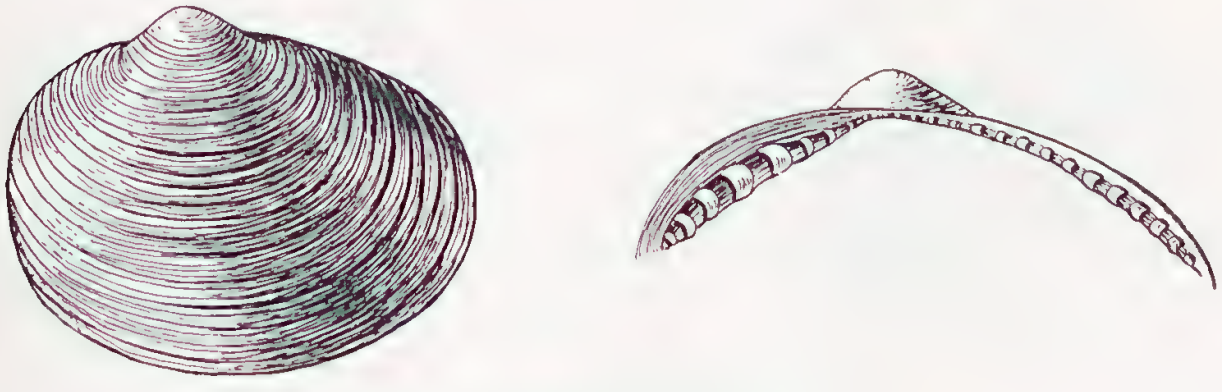

Fig. 1. *Protonucula verconis* sp. nov.

Type. 120 miles west of Eucla, 300 fathoms. 3·5 mm. x 2·7 mm. In South Australian Museum (D. 10119).

Loc. Cape Jaffa to 120 miles west of Eucla, 130 to 300 fathoms.

The Cape Jaffa shells were those previously incorrectly listed as *Sarepta obolella* Tate.

PRONUCULA CANCELLATA sp. nov.

May (1) recorded *Pronucula decorosa* Hedley from Pilot Station, but did not consider his specimens typical, and later labelled them in his private collection with a new specific name. A close examination of these specimens shows (as do May's illustrations, *loc. cit.*) that they are quite different from *P. decorosa* Hedley. They are therefore described below as a new species.

Shell obliquely oval, minute, inequilateral, umbos moderately prominent, umbonal third smooth, then concentric lirae, and radial lirae of equal validity and spacing, so as to make square spaces; ventral border distinctly denticulate internally and externally.

Type. Pilot Station, 9 fathoms (W. L. May). In South Australian Museum (D. 10114).

Loc. Pilot Station, 9 fathoms; Gulf St. Vincent to St. Francis Island, 15 to 62 fathoms.

PRONUCULA CONCENTRICA sp. nov.

Shell obliquely oval; about forty close concentric lirae, no radials; ventral border minutely denticulate within; eight teeth on one side of the condrophore, fourteen on the other.

Type. Gulf St. Vincent, 20 fathoms. 3·8 x 3·3 mm. In South Australian Museum (D. 10115).

Fig. 2. *Pronucula concentrica* sp. nov.

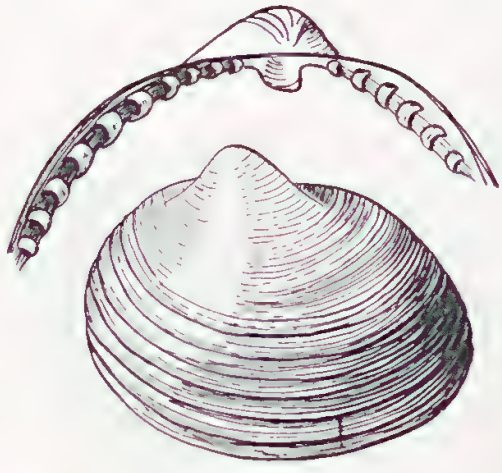

Fig. 3. *Pronucula flindersi* sp. nov.

PRONUCULA DECOROSA Hedley.

Hedley recorded this species from Port Kembla in 1902 and from 100 fathoms off Cape Wiles in 1911. The specimens from the following localities are typical.

Loc. McDonnell Bay to 120 miles west of Eucla, 6 to 300 fathoms.

(1) Proc. Roy. Soc., Tasm., p. 81, pl. 8, fig. 42, 1915.

PRONUCULA FLINDERSI sp. nov.

Shell roundly oval, slightly oblique, median portion of the dorsal margin straight; umbos rather large and prominent; six teeth on one side of the chondrophore, ten on the other; ventral margin smooth; umbonal third of surface smooth, concentric ribs developing towards the margin, no radial sculpture.

Type. 120 miles west of Eucla, 300 fathoms. 4 mm. x 3 mm. In South Australian Museum (D. 10116).

Diagnosis. From *P. micans*, is more equilateral, rounder, not so long, has more prominent umbos, and fewer hinge teeth.

PRONUCULA HEDLEYI Pritchard and Gatliff *(Nucula).*

South Australian and Western Australian specimens have the inner ventral margin denticulate.

Loc. McDonnell Bay to 120 miles west of Eucla, 6 to 300 fathoms.

PRONUCULA MICANS Angas *(Nucula).*

Loc. Beachport to King George Sound, 6 to 150 fathoms.

NUCULA BEACHPORTENSIS Verco.

Loc. Beachport to 120 miles west of Eucla, 40 to 300 fathoms.

NUCULA DILECTA Smith.

Loc. Port Arthur, 50 to 70 fathoms.

NUCULA SUBDILECTA Iredale.

Apparently *N. obliqua* Lk. does not occur in South Australia; specimens so diagnosed are much less ventricose and less solid, have smaller teeth, and a more acutely angled anterior margin. These should probably be named *N. subdilecta* Iredale.

Loc. Beachport to 120 miles west of Eucla, 90 to 300 fathoms.

SCAEOLEDA CRASSA ILLEPIDA Iredale.

Loc. Beachport to St. Francis Island, 14 to 62 fathoms.

SCAEOLEDA DOHRNI Hanley *(Leda).*

South Australian deep-water specimens much more resemble Iredale's fig. 14 (2), which he says is the Peronian shallow-water form.

Loc. Beachport to Cape Jaffa, 100 to 150 fathoms.

(2) Iredale, Proc. Linn. Soc., N.S.W., xlix, pt. iii, p. 185, pl. 35, fig. 14, 1924.

SCAEOLEDA VERCONIS Tate *(Leda)*.

Loc. Kingston to Fremantle, common in 10 to 20 fathoms.

TERETILEDA FORTIS Hedley *(Leda)*.

The South and Western Australian shell is less solid.

Loc. Cape Jaffa to 120 miles west of Eucla, 130 to 300 fathoms.

COMITILEDA CURTIOR sp. nov.

This species somewhat resembles *C. pala* Hedley, but is less solid, has a more obtuse umbonal angle, and the posterior dorsal margin slightly convex, not slightly concave, so giving it a rounder appearance. The ventral margin is smooth. A fresh specimen has the dorsal margins tinged pink colour.

Type. 120 miles west of Eucla, 300 fathoms. 3·2 mm. x 2·5 mm. In South Australian Museum (D. 10118).

Loc. 40 to 120 miles west of Eucla, 72 to 300 fathoms.

COMITILEDA MILIACEA Hedley *(Leda)*.

A careful examination of South Australian specimens establishes their identity with *C. miliacea* Hedley.

Loc. Cape Jaffa to 120 miles west of Eucla, 300 fathoms.

COMITILEDA REMENSA Iredale.

Iredale (3) states: "Hedley's *Leda pala* may be at present included in *Comitileda*, as the species *remensa*, the type locality being 100 fathoms, 40 miles south of Cape Wiles, South Australia, appears to have been regarded by Verco as *pala*, from which it differs in size and shape as well as hinge formation."

Probably this means Hedley's *Leda pala* may be at present included in *Comitileda*, as also the species *remensa*, the type locality of this being 100 fathoms, 40 miles south of Cape Wiles, South Australia. This appears to have been regarded by Verco as *pala*, from which it differs in size and shape as well as hinge formation.

The specimens recorded by Verco from 130 fathoms, Cape Jaffa, as *Leda pala* Hedley are not that species, but *C. remensa* Iredale, as he suggests.

Loc. Cape Jaffa to 120 miles west of Eucla, 130 to 300 fathoms.

POROLEDA SPATHULA Hedley.

Specimens from localities given below correspond exactly with Hedley's cotypes. They all have a slightly curved radial depression towards the short end of the shell running from the umbo to the ventral margin, which is con-

(3) Rec. Austr. Mus., xvii, No. 4, p. 159, 1929.

sequently feebly notched there. This appears to have been omitted in Hedley's picture of the type, since it is present in the cotypes.

Iredale *(loc. cit.)* introduces a new species, *P. flindersi*, "which differs from *spathula* in the presence of a fine radial sculpture." Hedley's cotypes have this fine radial sculpture, and it is also obvious in his illustration of the type.

Loc. Schouten Island, 40 fathoms (May); Beachport to 90 miles west of Eucla, 40 to 200 fathoms.

LAMELLILEDA gen. nov.

This genus is introduced for *L. typica* sp. nov. (described below), which is nearest in shape to *Poroleda*, but differs in having both the anterior and posterior hinge teeth lamellar.

LAMELLILEDA TYPICA sp. nov.

Shell thin, slightly curved, compressed, subcylindrical, very inequilateral, umbo small, distinct, post-dorsal border very slightly concave, anterior border sharply rounded; ventral border gently convex, nearly parallel with the dorsal, rising gradually behind; posterior end roundly truncate; fine accremental striae, no radials; teeth laminate and imbricate, both anterior and posterior, five in front, ten behind; cartilage groove narrow, elongate, running backwards from the umbo; light horn coloured, smooth, and glistening. Largest specimen 15 mm. x 4 mm.

Type. 120 miles west of Eucla, 300 fathoms. 11·2 mm. x 3·2 mm. In South Australian Museum (D. 10117).

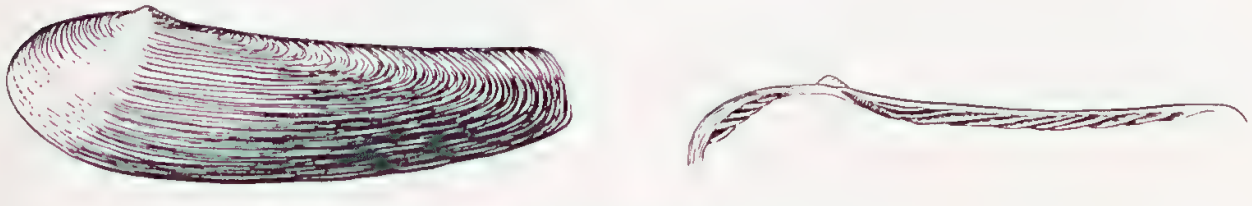

Fig. 4. *Lamellileda typica* sp. nov.

OVALEDA TELLINAEFORMIS Hedley *(Sarepta ?)*.

One left valve, 10·4 mm. x 7·8 mm., typical.

Loc. Beachport, 200 fathoms.

AUSTROSAREPTA RUBRICATA Tate *(Limopsis)*.

Loc. Beachport to 120 miles west of Eucla, 17 to 150 fathoms.

AUSTROSAREPTA RHOMBOIDALIS Verco *(Lissarca)*.

Loc. Port Phillip to Cape Jaffa, 7 to 300 fathoms.

MICROCUCULLAEA ADELAIDEANA Iredale.

Loc. Cape Jaffa to 120 miles west of Eucla, 50 to 300 fathoms.

PLEURODON MAORIANUS Hedley.

Loc. Cape Wiles, 100 fathoms; and 120 miles west of Eucla, 300 fathoms.

BARBATIA PISTACHIA Lamarck.

No species of true *Arca* occur in South Australia, and only two species of *Barbatia.*

Loc. Beachport to Geraldton (W.A.), 7 to 200 fathoms.

BARBATIA LAMINATA Angas.

Loc. Beachport to Rottnest, down to 150 fathoms.

BARBATIA FUSCA Bruguiere *(Arca).*

Loc. Shark Bay, Northern Territory, Townsville.

BARBATIA VIRESCENS Reeve *(Arca).*

North West Australian specimens agree with Reeve's description and picture.

Loc. Shark Bay and Broome.

ARCA SOLIDA Sowerby.

Specimens from the following localities appear to be this species. Those from Moreton Bay are most ventricose, those from Burleigh Heads least.

Loc. Shark Bay (5 specimens), Moreton Bay (5 specimens), Burleigh Heads (7 specimens).

ARCA NAVICULARIS Bruguiere.

Two authors recorded this species from South Australia. No specimen from this State is in this Museum, nor did Sir Joseph Verco take it on any beach, or during his dredging operations as far west as Fremantle. It does not appear indigenous to South Australia.

ANADARA TRAPEZIA Deshayes *(Arca).*

The South Australian subfossil appears to be the same species as the living Peronian shell, and has probably become extinct owing to climatic changes. It is common on the raised beaches of South Australia. At Moana Beach single worn valves may be found at the water's edge, and may easily be mistaken for recent shells.

Loc. Aldinga Bay; Victor Harbour; Moana Beach; Outer Harbour, in mud dredged from the Port River; Ardrossan; Cape Thevenard; Streaky Bay; Denial Bay; Murat Bay.

Largest specimen, 83 mm. x 60 mm., Streaky Bay.

GLYCYMERIS STRIATULARIS Lamarck *(Pectunculus)*.

Loc. Beachport to Rottnest, down to 28 fathoms.

GLYCYMERIS STRIATULARIS PENELEVIS subsp. nov.

Shell ovate, slightly inequilateral, rounded anteriorly and posteriorly; postero-dorsal and antero-dorsal margins almost straight; ventral convex; area in each valve 20 mm. long and 2·4 mm. wide; nine anterior teeth and eleven posterior; sculpture, very fine radial riblets, only visible under the lens, too numerous to count, obsolete within; ventral margin internally denticulate; surface externally cream coloured, faintly marked with fine, zigzag, brownish-red lines about the umbo; internally white; epidermis velvet-like, hairy towards the margin.

Type. 45 mm. x 37·2 mm., joined valves 21 mm. wide, 12 fathoms, Gulf St. Vincent. In South Australian Museum (D. 10100).

Diagnosis. Differs from *G. striatularis* in being much more compressed and having a thinner shell and finer sculpture.

Fig. 5. *Glycymeris striatularis penelevis* subsp. nov.

GLYCYMERIS SORDIDUS Tate *(Pectunculus)*.

Loc. Rapid Head to St. Francis Island, 9 to 22 fathoms.

GLYCYMERIS INSIGNIS Pilsbry.

This is closely related to *G. sordidus* Tate, but differs in being smaller, more solid, more ventricose, and having more valid, fewer, concentric rest steps, the posterior-dorsal margin straighter, a more acute postero-ventral angle.

Loc. King George Sound, 35 fathoms; and Bunbury, 15 fathoms.

GLYCYMERIS FLABELLATUS Ten.-Woods *(Pectunculus)*.

Iredale introduced a new South Australian species *Glycymeris broadfooti*, without an illustration. Careful examination of a large number of specimens of all ages reveals that his description corresponds exactly with the characters of adult forms of *G. flabellatus*.

Loc. Beachport to 120 miles west of Eucla, 8 to 150 fathoms.

GLYCYMERIS RADIANS Lamarck *(Pectunculus.)*

Loc. Cape Jaffa to Albany, 6 to 27 fathoms.

GLYCYMERIS GRAYANUS Dunker.

Only two worn odd valves found at Wallaroo by Dr. Gosse. Almost certainly came in ship's ballast.

Loc. McDonnell Bay to St. Francis Island, down to 30 fathoms.

ASPALIMA ERECTUS IDONEA Iredale.

Loc. Beachport to 35 miles south-west of Neptune islands, 104 to 300 fathoms.

LIMOPSIS EUCOSMUS Verco.

A specimen from 100 fathoms 120 miles west of Eucla measures 17·6 mm. x 16·5 mm.

Loc. Beachport to 120 miles west of Eucla, 40 to 300 fathoms.

LIMOPSIS VIXORNATA Verco.

Loc. Beachport to St. Francis Island, 45 to 110 fathoms.

LIMOPSIS VIXORNATA OCCIDENTALIS subsp. nov.

Differs from *L. vixornata* Verco in being higher than long and more triangular.

Type. Bunbury, 22 fathoms. 11 mm. x 11·5 mm. In South Australian Museum (D. 10123).

LIMOPSIS PENELEVIS Verco.

The type locality is Beachport, 150 fathoms.

Loc. Beachport to 120 miles west of Eucla, 90 to 300 fathoms.

LIMOPSIS TENISONI Ten. Woods.

Loc. Backstairs Passage to 90 miles west of Eucla, 10 to 130 fathoms.

LIMOPSIS TENISONI FORTERADIATUS subsp. nov.

Differs from *L. tenisoni* in being more triangular and comparatively higher, having fewer and stouter radials, and more numerous hinge teeth.

Type. Port Adelaide. 21·5 mm. x 22 mm. In the South Australian Museum (D. 10125).

Loc. Gulf St. Vincent to Fremantle, down to 35 fathoms.

LIMOPSIS TENISONI TENUIRADIATUS subsp. nov.

Differs from *L. tenisoni* in being more oblique, having finer, more numerous radials, and fewer hinge teeth.

Type. Encounter Bay. 27 mm. x 22·5 mm. In South Australian Museum (D. 10126).

Loc. McDonnell Bay to King George Sound, down to 81 fathoms.

CYRILLISTA CONCENTRICA Verco *(Sarepta).*

This should be placed in the Family *Limopsidae.*

Loc. Cape Jaffa to 120 miles west of Eucla, 17 to 150 fathoms.

ATRINA TASMANICA Ten. Woods.

A perfect specimen from Spencer Gulf measures 230 mm. x 135 mm. The South Australian shell is not separable from the Tasmanian, therefore Hedley's variety *dumosa* is a synonym.

Loc. South Australia as far west as Murat Bay, down to 15 fathoms.

PINNA DOLABRATA Lamarck.

Unworn juvenile specimens have closely scaled radial ribs and faint rusty-coloured rays, which suggests that *Pinna virgata* Menke is a synonym. The scales are often completely eroded in the adult, though sometimes quite marked at the border. A specimen from Gulf St. Vincent measures 15 inches long.

Loc. South and Western Australia.

ISOGNOMON SPATHULATA Reeve.

A single living specimen from St. Francis Island appears to be this species.

MELEAGRINA MARGARITIFERA Linnaeus *(Mytilus).*

No recent species of the genus *Meleagrina* is known to occur in South Australia. Probably Tate's record was based on the subfossil shell which is occasionally found.

ELECTROMA GEORGIANA Quoy and Gaimard *(Avicula).*

Very variable in colour and shape.

Loc. South Australia to Fremantle, down to 104 fathoms.

ELECTROMA PUNCTULATA Reeve *(Avicula).*

This species was wrongly identified by Tate as *Pteria zebra* Reeve. It differs from *Electroma georgiana* Reeve in being smaller, more globose, and thicker.

Loc. Royston Head, Aldinga, and Fowler's Bay.

MALLEUS MERIDIANUS sp. nov.

Lamarck named the following species of *Malleus* from Australia: *Malleus albus, vulgaris* and variety (b), *normalis* varieties (a) and (b), *vulsellatus*, and *decurtatus*. According to Chenu's illustrations, *M. albus* is the Queensland species, with a long body regularly validly undulate at the margins, and is therefore not applicable to the South Australian shell, neither are *M. vulgaris, normalis* variety (a), and *decurtatus*, which are very darkly coloured. Both *vulgaris* variety (b) and *normalis* variety (b) agree with South Australian shells. However, *M. vulgaris* variety (b) is obviously a distinct species from *M. vulgaris*, as is *M. normalis* variety (b) from *M. normalis*. Therefore, the South Australian shell being unnamed, *Malleus meridianus* is proposed for it.

Loc. South Australia, Albany, Fremantle, and Shark Bay.

NOTOVOLA ALBA Tate *(Pecten).*

In South Australian and Victorian specimens, large and small, the radial ribs on the convex valve are usually quite smooth; never deeply grooved as in some specimens from Albany. Largest specimen 145 mm. x 130 mm. from Tasmania.

Loc. Port Phillip to Albany, 7 to 40 fathoms.

MIMACHLAMYS ASPERRIMUS Lamarck *(Pecten).*

Very variable in colour and sculpture. Largest specimen 94 mm. x 97·5 mm. from Western Australia.

Loc. Beachport to Albany, 6 to 55 fathoms.

MIMACHLAMYS AUSTRALIS Sowerby *(Pecten).*

Sowerby described it from Swan River. It is probably a distinct species, and not a synonym for *P. asperrimus* Lk., which also occurs in Western Australia. *M. australis* Sby. has more prominent, closely packed scales on the ribs and auricles; the ribs are fewer and the shell more equilateral. Largest specimen 65 mm. x 65 mm. from Albany.

Loc. Albany, King George Sound, 10 to 28 fathoms.

MIMACHLAMYS (TALOCHLAMYS) FAMIGERATOR Iredale.

Hitherto this has not been definitely recorded from the Flindersian region, but specimens from numerous localities therein have been taken by Dr. Verco.

Loc. Beachport to Albany, 40 to 200 fathoms.

MIMACHLAMYS (VEPRICHLAMYS) PERILLUSTRIS Iredale.

Dr. Verco dredged six valves in South Australian waters.

Loc. Beachport, 200 fathoms; Cape Jaffa, 130 to 300 fathoms.

SCAEOCHLAMYS (BELCHLAMYS) AKTINOS Petterd *(Chlamys)*.

Though superficially resembling *M. asperrimus* Lk., it may readily be distinguished by the very small posterior auricle and fine shagreen sculpture.

Loc. Port Phillip to Albany, 13 to 35 fathoms (Dr. Verco).

EQUICHLAMYS BIFRONS Lamarck *(Pecten)*.

This is found in South Australia and Tasmania, and is recorded by Hedley from New South Wales, between Green Cape and Gabo Island. It is not recorded from Victoria or Western Australia. A subfossil from Murat Bay agrees with the recent shell. Largest specimen 135 mm. x 125 mm., Derwent Estuary, Tasmania.

Loc. Beachport to St. Francis Island, living in 4 to 20 fathoms, dead at 35 fathoms; Murat Bay, subfossil.

NOTOCHLAMYS gen. nov.

This genus is proposed for *Chlamys anguineus* Finlay = *P. undulatus* Sowerby. The radial sculpture of the two valves is dissimilar; the primary radials few (six or seven).

Differs from *Equichlamys* in having very unequal auricles, and from *Mesopeplum* in having the surface covered with fine shagreen sculpture and not concentric threads.

NOTOCHLAMYS ANGUINEUS Finlay.

Rare in South Australia, much more common in Western Australia. When adult the ventral margin of the left valve is curved towards the right valve. Size, 39 mm. x 38 mm.

Loc. Beachport, 40 fathoms; and Yorke Peninsula, Hopetoun, Albany, Bunbury, and Fremantle, 15 to 35 fathoms.

NOTOCHLAMYS TASMANICUS Ads and Angas *(Pecten)*.

When adult it is larger than *M. anguineus*, and the ventral margin of the left valve is not curved towards the right valve as in adult specimens of that species. Size, 62 mm. x 62 mm.

Loc. Beachport to Corney Point, 12 to 40 fathoms.

MESOPEPLUM CAROLI Iredale.

Iredale described this species from "40 to 80 fathoms off the New South Wales coast." In juvenile and unrubbed adult specimens from the Flindersian region the concentric threads are plainly visible in both valves, over both the interspaces and the radial ribs. In rubbed specimens the threads may be absent from the prominent ribs in the middle of the shell, while visible on the ribs near the sides. Flindersian specimens closely resemble the Peronian (according to Iredale's description and illustrations), as is frequently the case with deep water shells.

Loc. Beachport, 40 fathoms; from 40 to 120 miles west of Eucla in 72 to 140 fathoms. (Dredged by Dr. Verco, 1912.)

CHLAMYS PULLEINEANUS Tate.

Only one specimen, the type of this shell (a right valve), has ever been found. It is questionably an Australian shell, and is therefore omitted from the South Australian fauna.

CTENAMUSIUM THETIDIS Hedley *(Amusium)*.

Loc. Beachport to Rottnest, 72 to 300 fathoms.

CHLAMYDELLA FAVA Hedley *(Cyclopecten)*.

Hedley's *Cyclopecten fava* and *obliquus* appear to be the same species. Co-types of the two species examined in conjunction with a large series from South and Western Australia show intergradation.

Left valves show gradual transition from no concentric lamellae to numerous. The stippling in the right valve is probably the typical condition, its absence accidental.

Adult specimens have the ventral margin of the right valve turned abruptly backwards at an obtuse angle following the curve of the left valve. This is absent from juvenile specimens, and hence does not appear in Hedley's figure, but is apparent in New South Wales specimens sent by Hedley.

Loc. Beachport to King George Sound, 40 to 150 fathoms.

CUSPIDARIA LEVIFRONS sp. nov.

Shell small, thin, subtrapezoidal, inflated, umbos fairly prominent, approximate; anterior margin rounded, posterior rostrate, gaping; dorsal margin slightly concave, ventral convex; posterior half with thirteen radial ribs, anterior smooth; accremental striae very fine; left valve clasping right postero-ventrally, and with slightly stronger sculpture. Hinge as in *C. pinna* Verco; white, translucent.

Type. 7·5 mm. x 5·3 mm., joined valves 4 mm. wide. 300 fathoms, 120 miles west of Eucla. In South Australian Museum (D. 10101).

Largest specimen, one left valve, 10·5 mm. long, 7 mm. high.

Diagnosis. Resembles *C. pinna* Verco, but differs in having the anterior half smooth (whence the name) and absence of the very large radials.

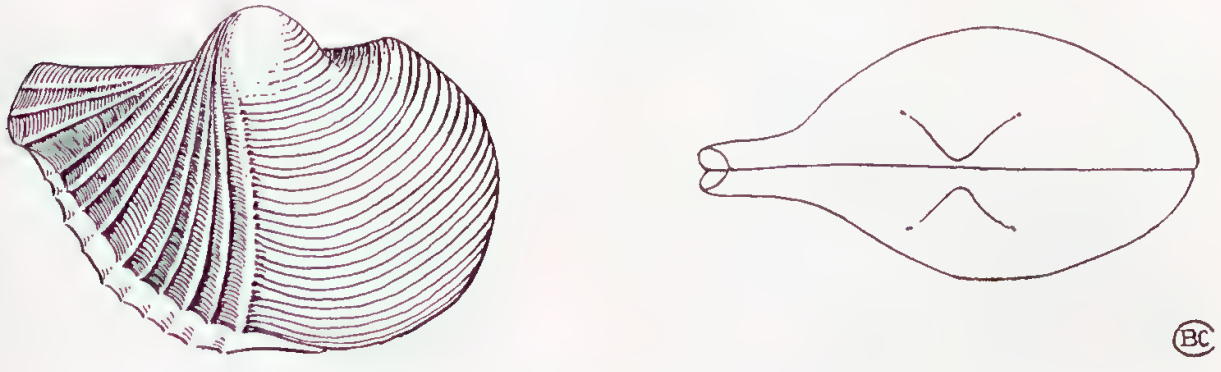

Fig. 6. *Cuspidaria levifrons* sp. nov.

CUNA SUBROTUNDA sp. nov.

Shell suborbicular, slightly cuneate, antero-lateral margin convex, postero-lateral slightly concave near the umbo; ventral convex, smooth except for very numerous, fine, concentric striae; white.

Type. 3·3 mm. x 3·2 mm. Spencer Gulf. In South Australian Museum (D. 10111).

Loc. Bunbury; Rottnest; N.W. of Cape Borda, 62 fathoms; Spencer Gulf; and Gulf St. Vincent.

Diagnosis. The suborbicular shape readily distinguishes this species. Sir Joseph Verco dredged over two hundred specimens of this shell in the Flindersian region, so that it is apparently common.

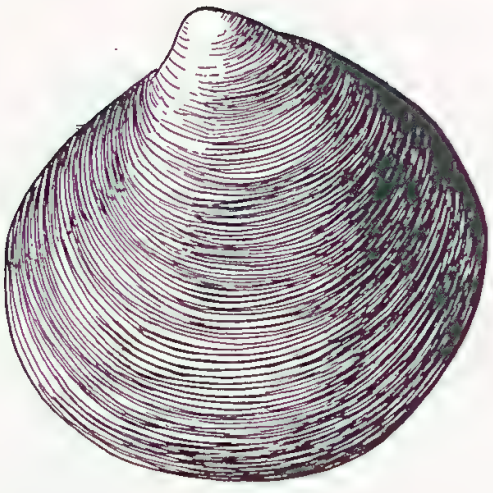

Fig. 7. *Cuna subrotunda* sp. nov.

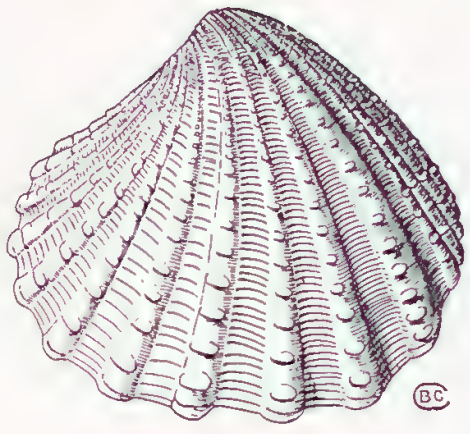

Fig. 8. *Venericardia propelutea* sp. nov.

CARDITA GEMULIFERA Tate.

Described from a unique specimen. Sir Joseph Verco (4) stated, "*Cardita gemulifera* Tate . . . . is only a mild variant of the above (i.e., *Venericardia amabilis* Deshayes)," and again in his manuscript notes, "I do not think this is a distinct species—it is scarcely a variety." An examination of Tate's type satisfies me that this is *Venericardia amabils* Deshayes.

CARDITA QUOYI Deshayes.

This species apparently does not occur in South Australia. Our shells identified as this species are *Cardita rosulenta* Tate, which is a *Venericardia*.

VENERICARDIA PROPELUTEA sp. nov.

Shell obliquely ovate, umbo turned anteriorly, postero-dorsal margin convex, antero-dorsal margin concave near the umbo, then becoming convex as it forms the anterior margin; sculpture of fifteen radial ribs, about as wide as the interstitial furrows, and beset with nodulose scales.

Type. 10 mm. x 10·1 mm. 14 fathoms, off Ardrossan. In South Australian Museum (D. 10106).

Diagnosis. Differs from the New Zealand *Venericardia lutea* Hutton (under which name it was recorded from South Australia) in having sculpture not so close, the postero-dorsal border much more convex, and the antero-dorsal border concave near the umbo, then becoming convex; not continuously slightly concave as in *V. lutea* Hutton.

CONDYLOCARDIA CRASSIDENTATA sp. nov.

Shell subtriangular, oblique, very inequilateral, umbos small; hinge plate (fig. 9) umbo-ventral depth about one-third of length, posterior cardinal tooth

(4) Trans. Roy. Soc., S. Austr., xxxii, p. 349, 1908.

thick, prominent, wedge-shaped, surface grooved near the inner margin, anterior cardinal long, narrow; sculpture of eighteen indistinct, scarcely prominent radials, crossed by four marked growth undulations; white.

Type. 8 mm. x 8 mm. Beachport, 40 fathoms. In South Australian Museum (D. 10110).

Loc. Beachport, 40 and 49 fathoms; Cape Borda, 62 fathoms; Cape Jaffa, 130 fathoms.

Diagnosis. *C. Compressa* Bernard is more oblique, has fewer radial ribs, the hinge plate umbo-ventrally deeper, teeth larger.

This species was recorded from South Australia by Verco as *C. compressa* Bernard.

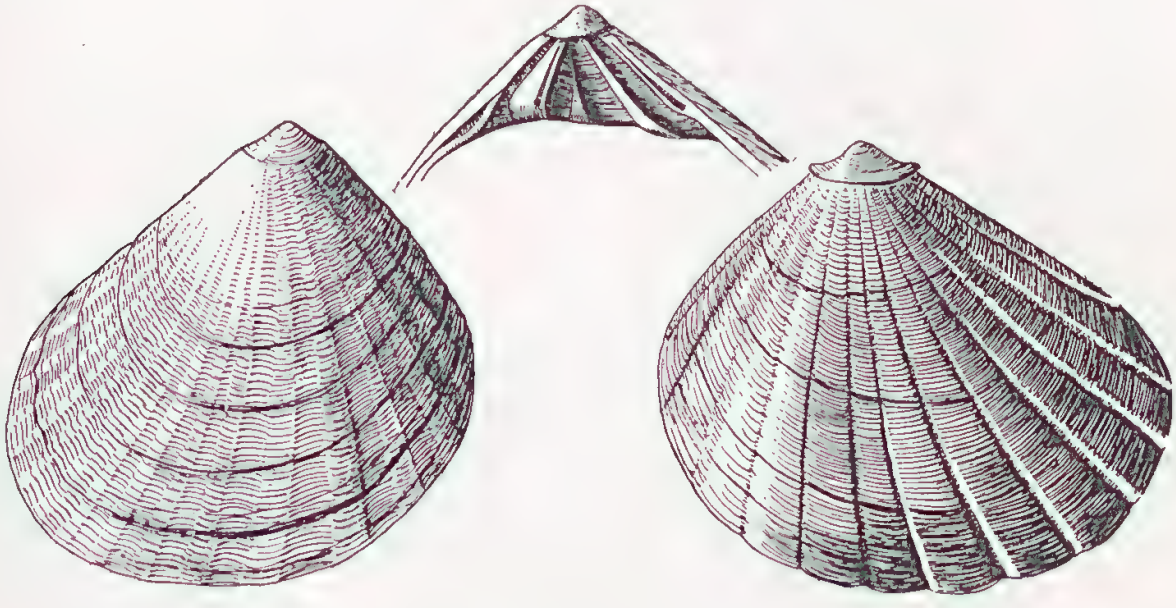

Fig. 9.
Condylocardia crassidentata sp. nov. and hinge.

Fig. 10.
Condylocardia rectangularis sp. nov.

CONDYLOCARDIA RECTANGULARIS sp. nov.

Shell triangularly ovate, inequilateral, postero- and antero-dorsal margins almost straight, forming a rectangle; posterior margin convex, sharply curved, anterior more widely curved; prodissoconch smooth; sculpture of fourteen flatly rounded radial ribs, crossed by fine accremental striae; interstices very narrow, almost linear; white.

Type. 2 mm. x 1·7 mm. Beachport, 40 fathoms. In South Australian Museum (D. 10113).

Loc. Guichen Bay; Gulf St. Vincent; Beachport, 40, 130, 150, 200 fathoms; Cape Jaffa, 90, 130 fathoms.

Diagnosis. From *C. porrecta* Hedley by the almost straight postero- and

antero-dorsal margins forming a rectangle; the apical angle in *C. porrecta* is more obtuse.

The type is from shells misidentified as *C. porrecta,* which apparently does not occur in South Australia.

CONDYLOCARDIA ISOSCELES sp. nov.

Shell minute, thin, sub-equilateral; prodissoconch strongly concentrically ribbed, validly defined from the rest of the shell, which is smooth, except for very faint accremental striæ.

Type. 1 mm. x 0·83 mm. Backstairs Passage. In South Australian Museum (D. 10108).

Loc. Backstairs Passage; Gulf St. Vincent; St. Francis Island, 35 fathoms; Sceales Bay; Cape Jaffa, 49 fathoms; Beachport, 40 fathoms.

Diagnosis. The strongly sculptured prodissoconch and lack of sculpture on the rest of the shell distinguish it from any known species of the genus.

This shell was misidentified as *C. trifoliata* Hedley, which has not been found in South Australia.

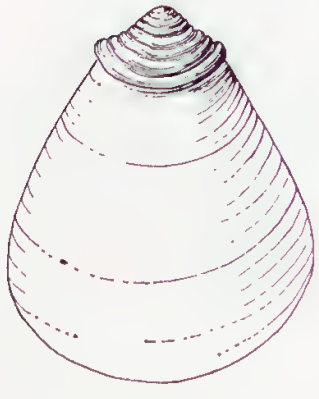

Fig. 11.
Condylocardia isosceles sp. nov.

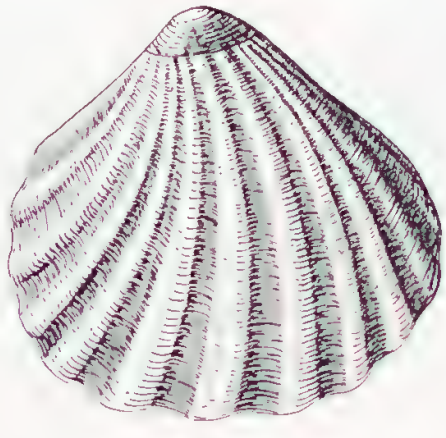

Fig. 13.
C. notoaustralis sp. nov.

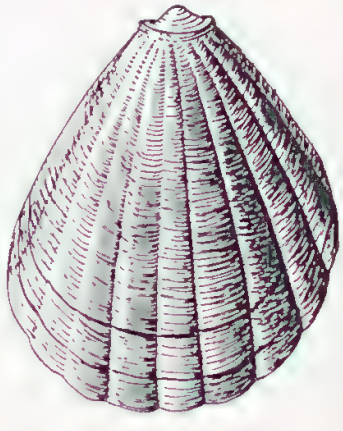

Fig. 12.
C. limaeformis.

CONDYLOCARDIA LIMAEFORMIS sp. nov.

Shell minute, triangularly ovate, oblique, obese, antero-dorsal and postero-dorsal margins slightly convex; apical angle about 70°; prodissoconch minute, smooth; sculpture of eleven, flatly convex radials, crossed by accremental striae; interstices linear; white.

Type. 1 mm. x 1·15 mm. Cape Borda, 62 fathoms. In South Australian Museum (D. 10112).

Loc. One valve, the type, from above locality, and numerous specimens without locality from Kenyon Collection.

Diagnosis. A rather distinct species, much more acutely angled at the umbo than *C. rectangularis.*

CONDYLOCARDIA NOTOAUSTRALIS sp. nov.

Shell obliquely ovate, thin, umbonal area projecting; prodissoconch indistinct; sculpture of thirteen flatly convex radial ribs and nearly equally wide interstices; crossed by accremental striae; margin slightly dentate; yellow.

Type. 1·5 mm. x 1·4 mm. Beachport, 200 fathoms. In South Australian Museum (D. 10109).

Loc. Gulf St. Vincent; Spencer Gulf; Guichen Bay; Beachport, 150 and 200 fathoms; Backstairs Passage; Geographe Strait (May).

Diagnosis. From *C. australis* Bernard by its more projecting umbonal area, fewer ribs, with nearly equal interstices.

This species was wrongly identified as *C. australis* Bernard.

CONDYLOCARDIA SUBRADIATA Tate *(Carditella).*

Specimens dredged in 50 to 120 fathoms west of Eucla and in 72 fathoms 40 miles west of Eucla by Sir Joseph Verco add another species and genus to the Western Australian list.

AUSTROTURQUETIA gen. nov.

This is proposed for *Turquetia integra* Hedley, which differs from *Turquetia fragilis* Velain, the type of Turquetia, in being equilateral, having a median umbo-ventral sulcus externally, and lacking the short, truncate posterior side and the concave posterior margin.

AUSTROTURQUETIA INTEGRA Hedley *(Turquetia).*

Loc. Cape Jaffa, 130 fathoms, one left valve, 6 mm. x 3·7 mm.

CORBULA IREDALEI sp. nov.

Tringularly ovate, very inequivalve, inequilateral, rounded anteriorly, angled posteriorly, ventral margin convex; a ridge runs from the umbo to the postero-ventral angle of each valve; right valve the larger overlapping the left ventrally and projecting beyond it posteriorly; coarsely, concentrically, widely grooved; left finely concentrically striated; hinge tooth of right valve and corresponding socket and cartilage process of left valve strongly developed; shell white, epidermis thick, brown.

Type. 21 mm. x 15·5 mm., joined valves 10·6 mm. 20 fathoms, off St. Francis Island, South Australia. In South Australian Museum (D. 10102).

Diagnosis. Hitherto known under the name of the exotic shell *C. tunicata*

Hinds, from which it may be distinguished by its comparatively greater height, coarser sculpture and greater overlapping of the right valve posteriorly.

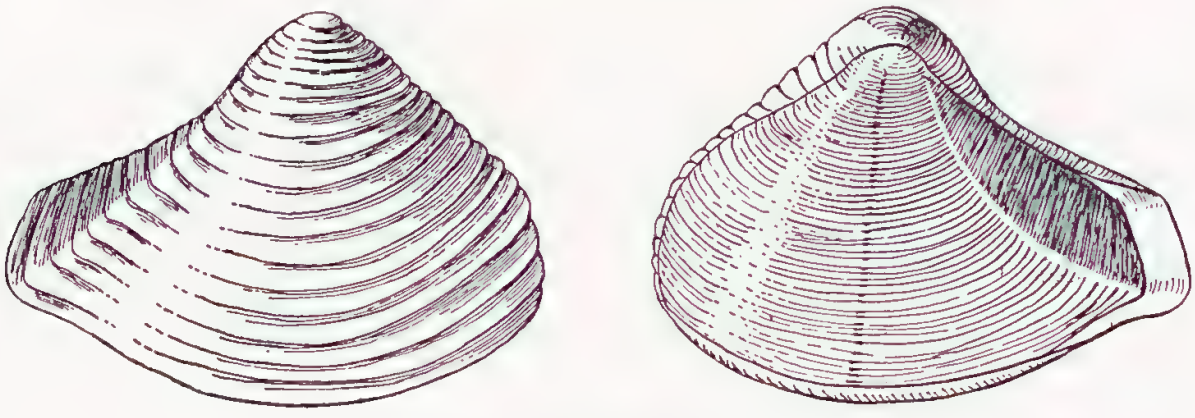

Fig. 14. *Corbula iredalei* sp. nov.

CORBULA FLINDERSI sp. nov.

Triangularly ovate; slightly inequivalve; rounded anteriorly, angled posteriorly; ventral margins convex throughout; a ridge runs from the umbo to the postero-ventral angle of each valve; right valve larger, overlapping left ventrally and posteriorly; both similarly sculptured with fine, regular, concentric grooves and very fine radial threads; dull white; epidermis yellowish-brown.

Type. 17 mm. x 10 mm., joined valves 8·8 mm. wide. 17 fathoms, Yankalilla Bay. In South Australian Museum (D. 10103).

Diagnosis. The finer sculpture, wholly convex ventral margin, and narrower posterior end separate this species from the exotic *C. scaphoides* Hinds, under which name the South Australian species has hitherto been known.

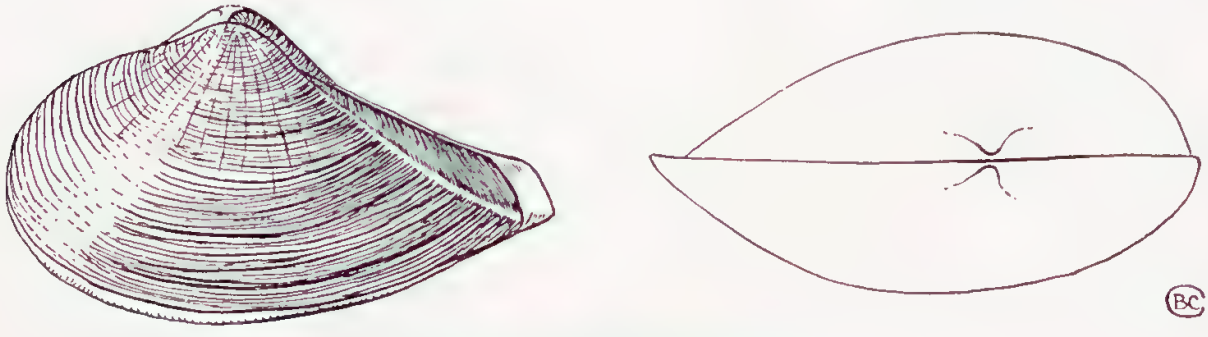

Fig. 15. *Corbula flindersi* sp. nov.

CORBULA VERCONIS Finlay.

Finlay (5) pointed out that the name *Corbula compressa* Verco (6) would have to be changed, having been twice used previously, so he introduced the above.

An examination of Tate's specimens shows that the recent shells recorded as *C. pixidata* Tate, a fossil species, are referable to *C. verconis* Finlay.

(5) Trans. N.Z. Inst., 57, p. 531, 1927.

(6) Trans. Roy. Soc., S. Austr., xx, p. 230, pl. 8, fig. 2, 1896.

A NEW SPECIES OF THE GENUS *EMARGINULA* FROM THE CAPRICORN GROUP.

By BERNARD C. COTTON, South Australian Museum.

Fig. 1.

Mr. W. J. Kimber recently presented to the South Australian Museum a number of shells collected by him on North-West Islet, among which was this new species of *Emarginula*.

Emarginula kimberi sp. nov.

Shell thin, translucent, ovate, wider posteriorly, widest across the apex; posterior slope slightly concave, anterior regularly convex; apex recurved, 9·5 mm. from the posterior end; fissure 5 mm. long, 1 mm. wide, edges bounding it vertical, standing above the surface of the shell; fasciole 11 mm. long, below the level of the margin, with numerous, coarse, accremental lamellae. Sculpture fifteen, low, sloping, primary, widely-spaced ribs (bearing from 7 to 11 minute tubercles) and 11 less distinct interstitial riblets; concentric sculpture of very fine accremental striae, just visible under 6× magnification; shell white or colourless, with pink rays between the primary ribs fading from the margins towards the apex; fasciole pink for 3 mm. from the fissure upwards.

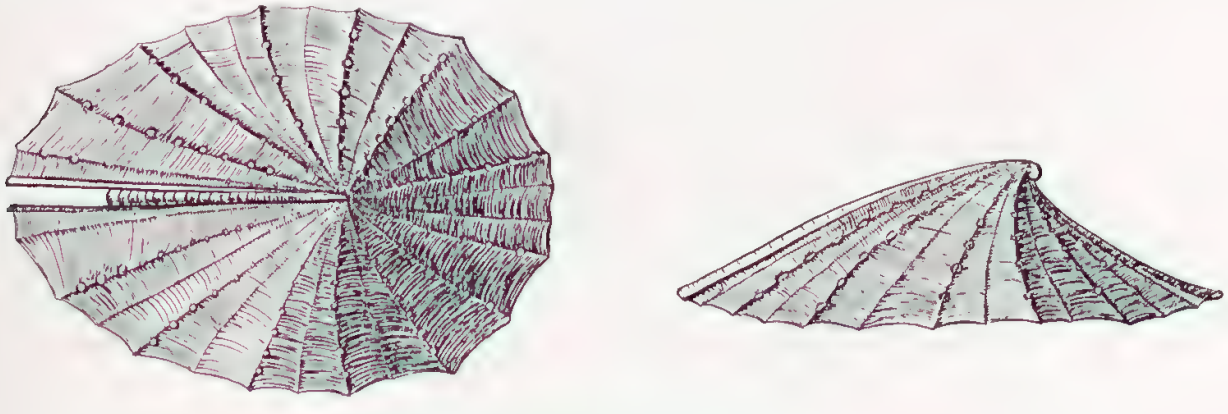

Fig. 1. *Emarginula kimberi* sp. nov.

Length, 25 mm.; width across apex, 18 mm.; height, 8 mm.

Habitat. North-West Islet (W. J. Kimber).

Type. Unique. Deposited in South Australian Museum (D. 10104).

The fissure, fasciole, recurved apex, and absence of internal shelf locate it in the genus *Emarginula;* the few widely-spaced radials and lack of concentric sculpture, apart from accremental striæ, distinguish it from any described species of this genus.

On AUSTRALIAN COLEOPTERA.

By ARTHUR M. LEA, F.E.S., Entomologist, South Australian Museum.

Part VI.

Fig. 1.

Family TENEBRIONIDAE.

Blaps gigas Linn. var. azorica Seidl. (1).

Numerous specimens of this African beetle were recently taken at Wallaroo (South Australia) by Mr. E. J. Johnson. It is probable that specimens were brought there (possibly in the larval form) in ballast of wheat ships. The species

Fig. 1. *Blaps gigas* Linn., var. *azorica* Seidl. (life size). *Photo, B. Cotton.*

is uniformly black, about an inch and a half in length, with a blunt spine at the apex of the suture. On the male only there is a fascicle of reddish spines near the base of the abdomen. In the Junk catalogue several synonyms and varieties of *gigas* are noted.

Egyptian specimens were standing in the Museum as *Blaps sulcata* (a synonym), but Mr. E. Ballard, Chief Plant Pathologist of the Ministry of Agriculture at Cairo, wrote of some Wallaroo specimens sent for identification:

(1) Seidl., Mon., p. 258.

"These specimens have been identified as *Blaps gigas* Linn., var. *azorica* Seidl.

"The type species is widely distributed on both sides of the Mediterranean from Spain to Palestine and the Canary Island, whereas the var. *azorica* has been found at the Azores and in Morocco."

FAMILY CURCULIONIDAE.

The following species all belong to the subfamily Cryptorhynchides. They are mostly small, of retiring habits, and clothed with brownish scales.

DECILAUS MEGAPHOLUS sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with scales varying from muddy-brown to black, and interspersed with numerous erect or suberect scales or stout setae.

Head with crowded, concealed punctures. Eyes small. Rostrum comparatively short and wide; with coarse, concealed punctures, and a narrow median carina. Prothorax distinctly transverse, sides strongly rounded, apex about half the width of base; with large, normally concealed punctures. Elytra not much longer than the median width, which is at about the basal third, base almost truncate, sides strongly rounded; with regular rows of large, round, deep punctures, scarcely indicated through clothing. Two basal segments of abdomen flat in middle, with very large round punctures. Legs short; femora stout, grooved, and edentate. Length, 4 mm.

♀ Differs in having the rostrum slightly longer, and the two basal segments of abdomen evenly convex.

Queensland: Laura (T. G. Sloane).

A short broadly pyriform species, with the erect setae or scales unusually stout. It is about the length of *D. expletus*, but is wider and with very different clothing. Most of the erect setae dilate to the apex, where each is about half as wide as long, on the elytra they are almost confined to the odd interstices, but they are easily disarranged. The punctures on the rostrum are large, but normally concealed on both sexes, they are apparently in four irregular rows, except in front, the median carina is only partly concealed by the clothing. The mesosternal receptacle is strongly elevated and shaped like a short Y. On two males the antennae are concealed, but one female has the head detached, and the antennae are seen to be inserted on the sides of the rostrum at the basal third.

DECILAUS ABDOMINALIS sp. nov.

♂ Black, antennae reddish. Densely clothed with muddy-brown scales, interspersed with numerous stout erect or suberect setae.

Head with small eyes and normally concealed punctures. Rostrum comparatively short, feebly curved; with irregular rows of coarse, concealed punctures, and with a fine median carina. Antennae inserted slightly nearer base than apex of rostrum, two basal joints of funicle elongate, the others transverse. Prothorax moderately transverse, sides strongly rounded, apex about half the width of middle; with coarse, crowded punctures, mostly traceable through clothing. Elytra not much wider than long, sides strongly rounded, base truncate; with rows of large, round, deep, partly concealed punctures. Metasternum and abdomen with a wide, shallow depression, common to both; the two basal segments with large concealed punctures. Femora stout, feebly grooved, and edentate. Length, 5 mm.

Queensland: Coen River (W. D. Dodd); unique.

In appearance like a large specimen of the preceding species, but not quite as robust, setae less stout, on the elytra not confined to the odd interstices, and abdominal punctures smaller, etc. It has the wide abdominal depression of the male of *D. auricomus*, but with scales there instead of hairs or thin setae. The punctures on the rostrum are normally concealed, but are indicated by four rows of short setae.

DECILAUS NITIDIROSTRIS sp. nov.

♂ Black, antennae reddish. Densely clothed with muddy-grey scales, varying to sooty.

Head with crowded, concealed punctures. Rostrum shining, comparatively thin, and moderately curved, with a thin and continuous median carina, and with four rows of punctures, becoming coarse towards, and concealed about base. Antennae inserted almost in exact middle of sides of rostrum. Prothorax not much wider than long, sides moderately rounded, apex about half the width of base; with crowded punctures mostly traceable through clothing, and with a short and feeble median ridge. Elytra oblong-cordate, base truncate and no wider than base of prothorax; with regular rows of large, partly concealed punctures, becoming smaller posteriorly. Mesosternal receptacle with almost U-shaped walls, thinner than usual. Abdomen with crowded punctures, about as large as those on prothorax, basal segment depressed in middle. Femora rather stout, grooved, and edentate. Length, 3·0–3·5 mm.

♀ Differs in having the rostrum slightly longer and thinner, punctures smaller and carina shorter and less distinct, antennae inserted slightly nearer its base, and basal segment of abdomen evenly convex.

Victoria: Melbourne in June and July, Oakleigh in July, Preston in June and September (F. E. Wilson), Ocean Grove (H. W. Davey).

In general appearance like small and rather dark specimens of *D. perditus*, but rostrum shining almost to base in both sexes, with much smaller punctures;

on both sexes of *perditus* the rostrum has much coarser and crowded punctures, on this species the punctures are sharply defined. It seems even nearer to *D. expletus*, but on that species the femora are slightly dentate. The upper surface has an obscurely speckled appearance, and is entirely without setae; these being few in number and only on the legs. The specimen from Ocean Grove was previously commented upon (2) as possibly a variety of *perditus*, but in error, as in addition to the thinner walls of its mesosternal receptacle, its rostrum has the small punctures of the female of the present species.

DECILAUS CURVIROSTRIS sp. nov.

Blackish, antennae and legs reddish. Moderately clothed with scales, varying from stramineous, through brown, almost to black, in addition with numerous short, sloping setae.

Head with crowded, concealed punctures. Rostrum rather stout, more strongly curved than usual, sides incurved to middle and notched at base, with a feeble median carina traceable almost to base; with irregular rows of punctures, concealed on basal half, sharply defined and naked in front. Antennae inserted almost in exact middle of sides of rostrum. Prothorax distinctly transverse, sides strongly rounded, apex truncate and about half the width of base; with crowded punctures, in places partly concealed. Elytra rather short, base gently trisinuate, with shoulders feebly clasping prothorax, sides subparallel to about middle; with rows of large, deep, partly concealed punctures. Mesosternal receptacle slightly elevated, briefly U-shaped. Abdomen with crowded punctures, smaller than on prothorax; basal segment flattened in middle. Femora stout, grooved, and very feebly dentate. Length, 4 mm.

New South Wales: Blue Mountains (Dr. E. W. Ferguson); unique.

A dingy species about the size of *D. expletus* and *D. irrasus*, but with looser clothing and more strongly curved rostrum. The pale scales on the upper-surface have a slightly vittate appearance on the prothorax, and a slight fasciate arrangement on the elytra; the setae are numerous, but are distinct only when viewed from the sides. At first glance the elytra appear to have numerous small, shining granules, but this is mostly due to short ridges separating the punctures in the rows.

DECILAUS MEDIOALBUS sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with variegated scales and with short, erect setae, in places forming fascicles.

Rostrum moderately short, with coarse, crowded, and mostly concealed punctures, and with a feeble median carina. Antennae inserted almost in middle of sides of rostrum. Prothorax slightly transverse, sides moderately rounded;

(2) Lea, Trans. Roy. Soc., S. Aust., 1913, p. 389.

with crowded, concealed punctures. Elytra briefly subcordate, sides strongly rounded; with rows of large, deep punctures, appearing much smaller through clothing, and often quite concealed. Mesosternal receptacle distinctly elevated, emargination semicircular. Under-surface with crowded, mostly concealed punctures; basal segment of abdomen gently depressed in middle. Femora stout, grooved, and scarcely visibly dentate. Length, 2·8–3·0 mm.

♀ Differs in having the rostrum shining, somewhat longer and thinner, with smaller punctures, concealed only near base, antennae inserted slightly nearer base of rostrum and basal segment of abdomen gently convex.

Victoria (Howitt and Blackburn collections): Dandenong Ranges (C. French, sen.), Belgrave in July (C. Oke), in January from leaf debris (F. E. Wilson), Beaconsfield in December under *Eucalyptus* bark, and Fern Tree Gully in March, July, and September (F. E. Wilson).

A specimen of this species was described ([3]) as possibly representing a variety of *D. noctivagus*, but with eighteen now before me it is evident that it belongs to a distinct although allied species, differing in the softer and more variegated clothing, which forms more distinct fascicles. On several specimens the rostrum is obscurely diluted with red. The clothing varies considerably, being much paler on some specimens than on others. On many (including the types) it is mostly pale on the pronotum, but with some dark spots or vittae at the base; the pronotum has two small fascicles at the apex and four placed transversely slightly nearer the apex than base; on the elytra the clothing is mostly sooty-brown, but there is nearly always a distinct, pale (on some specimens almost white), transverse spot across several interstices near the middle; there are from ten to twelve blackish fascicles on each elytron, on the third, fifth, and seventh interstices, but occasionally one on the fourth. On several specimens the clothing on the upper-surface is but feebly variegated, but the fascicles are usually darker than the adjacent parts, and the median spots on the elytra are usually traceable. On an occasional specimen the pronotum has an almost white median line. On the under-surface and legs (except that the latter usually have a few blackish spots) the clothing is uniformly pale. On specimens with scales completely abraded from the upper-surface, the pronotum is seen to be without a median carina, and the elytral interstices to be slightly thickened or subtuberculate at the positions of the fascicles.

DECILAUS ALBOHUMERALIS sp. nov.

Black, rostrum obscurely diluted with red, antennae and parts of tibiae and tarsi paler. Densely clothed with variegated scales and setae, the latter forming distinct fascicles.

([3]) Lea, Trans. Roy. Soc., S. Aust., 1905, p. 209.

Rostrum moderately wide and gently curved, notched on each side of base; apical half (more along middle) shining, and with crowded and sharply defined but not very large, punctures, and with a shining median line, elsewhere densely clothed. Antennae inserted about two-fifths from apex of rostrum. Prothorax strongly transverse, sides rounded and suddenly narrowed near apex; punctures crowded and normally concealed. Elytra rather short, subcordate, base almost truncate, sides strongly rounded and widest at about basal third, margins narrowly polished; with rows of large, partly concealed punctures, interstices tuberculate beneath fascicles. Under-surface with concealed punctures. Basal segment of abdomen flat in middle, its middle encroaching on second, which is very short in middle, fifth rather strongly convex, third and fourth depressed. Femora stout and (especially the hind ones) distinctly grooved and edentate; tibiae thin. Length, 2·5 mm.

Victoria: Belgrave, in August, in moss.

At first glance differing only in clothing from the preceding species, but the mesosternal receptacle is U-shaped, with thin walls scarcely elevated above the adjacent surface and almost open; whereas on that species (as on *D. noctivagus*) the receptacle is distinctly elevated, and with a stout base; the present species also has the third and fourth abdominal segments depressed below the adjacent ones (the insect viewed on its back). On the type the clothing on the head, sides of prothorax, shoulders and parts of under-surface, and of legs is pale, almost white, elsewhere it varies from rusty-brown to black. There are six fascicles on the pronotum: two at apex and four forming a submedian row, of which the inner ones are long, and composed of black setae; on each elytron there are about ten fascicles, mostly on the odd interstices, with the central setae black and the outer ones rusty-brown, the largest is on the third interstice crowning the apical slope. The type is probably a male. On a second specimen, apparently a female, the clothing is mostly darker, but the pale humeral spots are quite distinct, its basal segment of abdomen is convex, and does not encroach on the second, but the rostrum and antennae are much the same.

DECILAUS PARVIDENS sp. nov.

♂ Piceous-brown, antennae and tarsi paler. Densely clothed with slightly variegated scales, and with numerous setae, in places forming fascicles.

Rostrum moderately short and almost straight, apical half shining and with dense and rather small punctures, basal half densely squamose. Antennae inserted not quite as close to apex as to base. Prothorax moderately transverse, sides strongly rounded, apex not half the width of base; punctures faintly indicated through clothing. Scutellum minute but fairly distinct. Elytra not much wider than prothorax, almost parallel-sided to beyond the middle, base truncate;

with regular rows of large, partly concealed punctures; third interstice distinctly elevated above the others. Abdomen with rather dense but not large punctures, second segment in middle as long as first, third and fourth on an even slope with the adjacent ones. Femora moderately long, grooved, and finely dentate, the hind ones more strongly than the others. Length, 3·5 mm.

♀ Differs in having the rostrum distinctly longer and thinner, with smaller punctures and less of the base clothed, and antennae inserted two-fifths from base of rostrum.

Queensland: Bunya Mountains in December (H. Hacker). Type, in Queensland Museum; cotype, in South Australian Museum.

A comparatively elongate species. The metasternal episterna are very narrow in the middle but are subtriangularly dilated at each end, although the clothing is apt to obscure their outlines. In this, as in some other features, it resembles *D. acerosus*, but the third interstice is more elevated and more distinctly fasciculate, the prothoracic setae are different, and the femora dentate. The scales on the upper-surface of the type are mostly of a rather dark brown, obscurely mottled with paler ones on the elytra. On its pronotum there are four feeble fascicles of dark setae across the middle, the setae at the apex are numerous but do not form fascicles; on the elytra they are fairly numerous on the odd interstices, and on the third form two loose fascicles; one at the basal fourth, the other crowning the apical slope; setae are numerous on the legs. On other specimens the scales are mostly paler, on one of them of an almost uniform pale muddy-grey, but the fascicles are in the same positions. The sexes scarcely differ in the convexity of the abdomen, but are very distinct by the length and clothing of the rostrum.

DECILAUS NIGROHUMERALIS sp. nov.

Blackish, antennae and tarsi reddish. Densely clothed with rusty-brown and black scales, becoming pale on under parts; in addition with numerous long, erect setae on apical half of elytra, becoming shorter towards base and on prothorax.

Rostrum about the length of prothorax, moderately curved, basal third squamose, elsewhere naked and with rather dense, small punctures. Antennae inserted about two-fifths from base of rostrum. Prothorax moderately transverse, sides rather strongly rounded, apex about half the width of base, punctures crowded and slightly traceable through clothing. Elytra rather short, sides strongly rounded, base almost truncate; with regular rows of large punctures, appearing much smaller through clothing. Mesosternal receptacle slightly elevated, rather briefly U-shaped. Abdomen with fairly dense, partly concealed

punctures, two basal segments evenly convex, and almost equal along middle. Femora moderately long, scarcely grooved, and edentate. Length, 2·8 mm.

Norfolk Island (A. M. Lea); unique.

Close to *D. hystricosus*, from New South Wales, but elytral setae longer, and each shoulder with a patch of black scales. The setae on the apical half of the elytra are almost as long as on *D. hispidus* (from Western Australia), but on the basal half and on the pronotum they are decidedly shorter. The scales on the upper-surface are mostly of a rusty-brown colour, obscurely mottled with black, but each shoulder has a large black patch. The setae are almost evenly distribuated on the pronotum, but are congested in four feeble patches across the middle, although hardly forming fascicles; the long setae on the elytra are in an almost regular row on each interstice, but on the second, about middle, there is a feeble fascicle, and another on the third near base. The type appears to be a female.

DECILAUS EPISTERNALIS sp. nov.

Piceous-brown, legs and antennae paler. Densely clothed with soft, variegated scales.

Rostrum moderately wide, slightly shorter than prothorax, sides gently incurved to middle, with a shining median line; apical half shining and with crowded punctures, elsewhere squamose. Antennae inserted almost in middle of sides of rostrum. Prothorax almost as long as wide, sides strongly rounded, punctures dense and normally concealed. Elytra short, subcordate, sides strongly rounded beyond basal third, rapidly narrowed to apex, base truncate, except that shoulders slightly clasp prothorax; with rows of large partly concealed punctures; suture glabrous on basal third, sides glabrous to near apex, and slightly thickened about shoulders. Under-surface with crowded, partly concealed punctures; each metasternal episternum appearing as a thin, stramineous line; two basal segments of abdomen flattened in middle. Femora stout, grooved, and edentate. Length, 2·5 mm.

Victoria: Lorne, in October, from moss (F. E. Wilson); unique.

Close to *D. bryophilus*, but without the two conspicuous rows of snowy scales on the apical half of suture of that species, and the tibiae wider at base. From *D. albonotatus* it differs in clothing and in the episterna; each of the latter appears as a thin clothed line, with the individual scales not distinct. The scales are mostly of a stramineous-brown, varying almost to white and to dark brown; on the pronotum the scales are larger than on the other parts, and very few of them are dark; on the elytra there are two fairly large, dark patches at the base, and the apical half is irregularly mottled; each of the seriate punctures on the elytra contains a seta, and there is a small cluster of suberect ones on each shoulder; on the legs the clothing is uniformly pale, but not white, the tibiae

appear to be dilated at the base, but this is entirely due to the clothing there being longer than in front. The type is probably a male.

On this and the three following species the elytral margins are glabrous, as on *D. suturalis, lateralis,* and *albonotatus* from Tasmania, and the episterna are distinctively clothed.

DECILAUS TRIANGULIFER sp. nov.

♂ Dark reddish-brown, some parts paler. Moderately clothed with more or less rusty-brown scales (setae on the prothorax) variegated with whitish ones.

Head with dense, concealed punctures in front, bald elsewhere. Rostrum about the length of prothorax, moderately curved, sides feebly incurved to middle, notched on each side of base; with dense, naked punctures on apical fourth, concealed by scales elsewhere. Antennae inserted about one-third from apex of rostrum, scape the length of funicle. Prothorax almost as long as wide, sides strongly rounded on basal two-thirds, apical third narrower; densely granulate-punctate. Elytra subcordate, sides strongly rounded on basal half, and much wider than prothorax, thence strongly narrowed to apex; with regular rows of large punctures, in deep striae, partly concealed by clothing; margins narrowly polished. Under-surface with crowded punctures; metasternum and basal segment of abdomen conjointly shallowly concave. Femora stout, especially the front ones, and edentate; tibiae rather thin. Length, 2 mm.

Victoria: Belgrave in January, and Healesville in March (F. E. Wilson).

Allied to *D. albonotatus* and *ruficornis,* from the latter distinguished by the darker club, and from the former by the sparser scales, amongst which are distributed sloping setae; each metasternal episternum also appears as an elongated, rusty-brown triangle, instead of a parallelogram, and its clothing is very dense, but so fine that the individual scales are not apparent. Each lateral margin of the elytra is glabrous, but it is not distinctly thickened as on *D. albonotatus, lateralis,* and *suturalis.* It is about the size and somewhat the appearance of *D. nigronotatus* and *nigriclavus,* but the episterna are very different. With the rostrum resting in the pectoral canal the base of the head is exposed, and is seen to be bald, but when the insect is "set," with the rostrum extended, the bald part is concealed. Most specimens are of a dark brown colour, the elytra, antennae (club excepted), and tarsi paler, but some have the prothorax and under-surface almost black, on others the legs and elytra are uniformly reddish, and on two specimens each elytron has a large, obscurely dark spot about the middle. The clothing on some specimens is but slightly variegated, but on several of them there are obscurely whitish spots on the elytra, usually margining the darker parts; on the pronotum also the whitish setae are almost as numerous as the darker ones. The setae on the elytra are sparse and curved,

and are rather distinct on the shoulders as viewed from the sides. Some specimens have less of the rostrum clothed, and the abdomen scarcely concave, and are probably females.

DECILAUS SEMICALVICEPS sp. nov.

Blackish-brown, antennae and legs paler. Moderately clothed with rusty-brown scales and setae, mixed with whitish spots about middle of elytra and sides of prothorax, metasternal episterna densely clothed with fawn-coloured scales, basal half of head bald.

Rostrum feebly curved and about length of prothorax, notched on each side of base; with crowded and rather coarse punctures, subseriate in arrangement in front, concealed near base. Antennae inserted about two-fifths from apex of rostrum, scape the length of funicle. Prothorax somewhat shorter, but otherwise with outlines and punctures as on preceding species. Elytra shorter and with more concealed punctures, but otherwise as on preceding species. Undersurface with fairly coarse punctures; two basal segments of abdomen gently and evenly convex. Femora stout, edentate, widely and shallowly grooved; tibiae rather thin. Length, 2·5 mm.

Victoria: Belgrave, in January and March (F. E. Wilson).

The club is darker than the rest of the antennae, although not by much; on *D. albonotatus* the club is darker, and the episterna are narrow and parallel-sided. There are some white scales on the suture, as on *D. bryophilus*, but the clothing of the episterna is very different. It is near the preceding species, and with clothing of the episterna similar, but continued inwards, so that it forms larger triangles; it is also larger than that species, and there is a vitta of whitish scales on each side of the prothorax, and the elytra are shorter in proportion, with punctures more obscured by clothing. The base of the head is bald, but is concealed when the insect is "set." There is an obscure median carina on the rostrum. The sides of the elytra are slightly thickened near the base, but are not conspicuously polished. As the abdomen is gently convex on both specimens they are probably females.

DECILAUS LINEIFER sp. nov.

Black, tarsi obscurely reddish, antennae paler. Moderately clothed with rusty-brown scales and setae.

Rostrum moderately wide and slightly curved, slightly shorter than prothorax, basal fourth with crowded, partly concealed punctures, then with punctures in four almost regular rows to apical fourth, on which they are small and irregular. Antennae inserted about two-fifths from apex of rostrum, scape the length of funicle. Prothorax moderately transverse, sides strongly rounded,

much narrower at apex than at base; densely granulate-punctate. Elytra briefly subcordate, sides strongly rounded and widest at basal fourth; with rows of large, deep punctures, mostly wider than interstices; margins narrowly glabrous but not shining. Under-surface with rather coarse punctures. Femora stout, tibiae thin, angular near the outer base. Length, 2·25 mm.

Victoria: Fern Tree Gully, in moss, in April and July (F. E. Wilson).

The rusty clothing of the elytra (mostly setae) appears to form three feeble fasciae at about the summit of the apical slope, and remnants of fasciae elsewhere; each metasternal episternum appears as a narrow, fawn-coloured line of clothing, of the same nature as on the two preceding species, but on those species each episternal patch is triangular. Structurally it is also close to *D. striatus* and *subfasciculatus*, but the episterna are narrower and densely clothed. The antennae are almost flavous. On the type the two basal segments of abdomen are flattened in the middle, on a second specimen they are gently convex, but as the sculpture and clothing of the rostrum are similar, they are probably both females.

DECILAUS RUFICORNIS sp. nov.

Blackish-brown, antennae and parts of legs paler. Moderately clothed with greyish or rusty scales and setae, becoming whitish on under parts.

Rostrum moderately wide, lightly curved and slightly shorter than prothorax; with crowded punctures and a fine median carina, but sculpture concealed by clothing about base. Antennae inserted about one-third from apex of rostrum, scape the length of funicle. Prothorax about as long as wide, sides rather strongly rounded, apex about two-thirds the width of base, densely granulate-punctate. Elytra subcordate, base truncate and no wider than base of prothorax, sides strongly rounded and widest at about basal third; with rows of large, deep, partly concealed punctures, the outer interstice shining and glabrous. Femora stout, shallowly grooved, and edentate; tibiae thin. Length, 2·0–2·2 mm.

Tasmania: Waratah, in moss (A. M. Lea).

Near *D. albonotatus*, the type of which was also from moss at Waratah, but darker and with less variegated clothing, and club no darker than other parts of antennae. The clothing varies on the two specimens taken, and I should probably have considered them as belonging to that species, but the club is distinctly black on the type of that species, and on the present one no darker than the rest of the antennae. On *D. lateralis* the thickened margin is so stout that it is visible from above; its prothorax also is trivittate. *D. suturalis* is a larger and darker species, with more numerous setae, and elytra more strongly narrowed beyond the middle. It is fairly close to *D. episternalis*, but smaller, and episterna not specially clothed, as on that species. The elytral interstices are fairly wide

and conjointly convex; on the preceding species they are separately convex. On the type the tibiae and tarsi are paler than the rest of the legs, but darker than the antennae; on the smaller specimen the legs and elytra are about as pale as the tibiae of the type, on both the base of the head (which would be normally concealed when the rostrum is extended) is of a dull red colour and bald. On the elytra the clothing is mostly of a pale rusty-brown colour, obscurely variegated with small, ill-defined, whitish spots; on the prothorax the clothing is distinctly setose in character; on the smaller specimen the clothing generally is paler and less variegated, and the prothoracic setae are smaller and denser. As the two basal segments of abdomen are gently convex, on both specimens, they are probably females.

On this and the two following species the sides of the elytra are thickened, and somewhat as on the four preceding species, but the metasternal episterna are without special clothing.

DECILAUS SUBFASCICULATUS sp. nov.

Black, antennae and tarsi reddish. Clothed with rusty-brown and greyish scales and setae.

Rostrum feebly curved, slightly shorter than prothorax, basal fourth clothed, elsewhere with dense and rather coarse, naked punctures, becoming smaller in front. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base; densely granulate-punctate. Elytra briefly subcordate, base truncate and very slightly wider than prothorax, sides strongly rounded and widest slightly before middle; with rows of large, deep punctures; interstices rather narrow and strongly convex, feebly thickened beneath fascicles. Two basal segments of abdomen gently convex. Femora stout, edentate, and shallowly grooved, tibiae rather thin, angularly dilated near outer base. Length. 2·5–2·6 mm.

Victoria: Belgrave, in moss, in April and August (F. E. Wilson).

A distinct species, allied to *D. striatus,* but slightly larger and with numerous subtubercular swellings of the elytral interstices. The metasternal episterna are opaque, parallel-sided, and slightly elevated, but are glabrous; this at once distinguishes the species from *D. lineifer,* which has similar general clothing. The elytral clothing is condensed to form numerous feeble fascicles, which are in three distinct transverse series at and about the summit of the apical slope, and irregular elsewhere; each fascicle is supported by a feeble tubercular swelling; on the under parts the setae are mostly whitish. The rostrum is rather strongly dilated to the base, each side of which is notched. Three specimens were taken, all apparently females.

DECILAUS ERYTHROPHOLUS sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with rusty-red scales and setae, slightly variegated on the elytra, and not much paler on the under- than on the upper-surface.

Rostrum gently curved, shorter than prothorax, sides incurved to middle and notched at base; with coarse (and apparently seriate) concealed punctures, but naked and smaller about apex. Antennae inserted about two-fifths from apex of rostrum. Prothorax distinctly transverse, sides strongly rounded; with crowded, partly concealed punctures. Elytra briefly subcordate, sides strongly rounded, base truncate, except that shoulders slightly clasp base of prothorax; with rows of large, partly concealed, setiferous punctures; margins narrowly glabrous but opaque. Two basal segments of abdomen large and feebly depressed in middle. Femora stout, rather widely grooved, and edentate. Length, 2·8–3·0 mm.

♀ Differs in having the rostrum longer, thinner, less curved, clothed only near base, with smaller punctures, antennae inserted not quite as close to apex, two basal segments of abdomen evenly convex, and femora somewhat thinner.

Victoria: Ringwood, in September (C. Oke).

A rusty-looking species not very close to any previously described one. Each metasternal episternum is narrow, and appears as a thin grey line, but there is a row of punctures between it and the narrowly nude elytral margin. On the male there are numerous small, dark spots on the elytra, but on the female they are less evident; the elytral setae are fairly long, curved, and very distinct from the sides; they are numerous on the legs, and cause the tibiae to have an appearance as if angularly dilated near the base.

DECILAUS WILSONI sp. nov.

♀ Black, legs obscurely reddish, antennae and tarsi paler. Moderately clothed with rusty-red setae, becoming greyish on under parts.

Rostrum feebly curved, almost the length of prothorax, sides dilated to and notched at base, near base clothed, elsewhere glabrous and with fairly coarse punctures, apex shining and with small ones. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides strongly rounded, apex about two-thirds the width of base; densely granulate-punctate. Elytra subcordate, sides strongly rounded, base slightly produced in middle, incurved between produced part and sides; with rows of large, deep, partly concealed punctures; interstices separately strongly convex, slightly thickened in parts about summit of apical slope. Two basal segments of abdomen evenly convex and with coarse punctures. Femora rather stout, grooved, and edentate; tibiae angulate near outer base. Length, 2·0–2·2 mm.

Victoria: Belgrave, in January, from moss; Healesville, in March, from moss (F. E. Wilson).

The narrow elytral margins are practically glabrous, but not conspicuously so, as on the seven preceding species. It is close to *D. lineifer* in general appearance, but is without the special clothing on the metasternal episterna of that species. The reddish clothing on four of the specimens is of the same shade as on *D. erythropholus*, but is more setose in character. It is wider in proportion than *D. striatus;* and smaller than *D. subfasciculatus*, with the tibiae different at base. On the type the setae on the prothorax are evenly distributed, but on the elytra they are subfasciculate and subfasciate at and about the summit of the apical slope, although less distinctly so than on *D. subfasciculatus;* the transverse arrangement is more distinct from the sides than from above. On another female, from Belgrave, the elytral clothing is almost uniformly distributed, although slightly more irregular about the summit of the apical slope than elsewhere. It is probably immature, as parts of the upper-surface and almost the whole of the under parts are reddish. A female from Millgrove, is more sparsely clothed than the others, and the setae are greyish or white; the subfasciate arrangement about the summit of the apical slope is fairly evident, and owing to its sparseness the slight thickenings of the interstices are more evident. A male, taken at Warburton in February by Mr. Wilson, from fallen leaves, probably belongs to this species, but is too dirty to be made into a type; its clothing is almost uniformly grey, the elytra are wider than on the type, gently undulated in parts, the punctures almost entirely concealed by mud, and those of the prothorax entirely concealed. The rostrum is shorter than on the female, clothed to near the apex, and the metasternum and basal segment of abdomen are conjointly shallowly concave.

An interesting species. That I am able to name as new ten species of this genus, all taken by Mr. Wilson from moss or fallen leaves in Victoria alone, indicates how much is to be done by this patient method of collecting.

DECILAUS ERYTHROMELAS sp. nov.

♂ Reddish, sides of prothorax and parts of elytra black, club deeply infuscated. Sparsely clothed with short, pale, rusty-grey scales or setae.

Rostrum feebly curved, slightly shorter than prothorax; with coarse, crowded punctures almost to apex, which is shining and with smaller ones. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base; with rather coarse, crowded punctures. Elytra subcordate, base truncate and very little wider than base of prothorax, sides strongly rounded and widest slightly before

middle; with rows of large, deep punctures; interstices rather narrow and strongly convex. Two basal segments of abdomen feebly depressed in middle, and with crowded punctures. Femora moderately stout and grooved, the front ones slightly but acutely dentate, tibiae subangulate near outer base. Length, 1·8 mm.

Victoria: Belgrave, from fallen leaves, in June (F. E. Wilson); unique.

A minute, aberrant species, apparently allied to *D. calviceps*, which also has front femora armed, but smaller, black parts of elytra differently placed, and no part of upper-surface densely clothed; the head has been forced back, concealing its base, so I am unable to see if that part is bald. In some respects it approaches *D. trivirgatus*, but is narrower and without the long hairs of that species. Structurally it is close to *D. nigriclavus*, but the black markings on the elytra are more extended, they occupy much of the sides, and are all irregularly connected, leaving the scutellar region, the tips, and much of the middle reddish. In general it is like a small, sparsely clothed specimen of *D. nigronotatus*, but on that species the front femora are unarmed.

DECILAUS MOLLIS Lea.

Two specimens taken at Belgrave (Victoria), in August, from leaf debris, by Mr. Wilson, are more brightly coloured than the types, each elytron having a conspicuous white semicircle commencing on the shoulder, and ending on the suture near the subbasal black fascicle, so that, from above, the elytra appear to have a distinct white figure 3. They have also more upright white setae than the types.

EXITHIUS MURINUS sp. nov.

♀ Black, antennae and tarsi reddish. Densely clothed with mouse-coloured scales, interspersed with short, erect setae, on the upper parts mostly black and condensed to form fascicles.

Head with forehead bald and sinuous in front. Eyes moderately large. Rostrum almost the length of prothorax, somewhat dilated at base, basal fourth densely squamose, elsewhere shining and with distinct punctures, small in front of antennae, coarser behind them. Antennae inserted slightly nearer base than apex of rostrum, scape scarcely more than half the length of funicle and club combined. Prothorax moderately transverse, sides strongly rounded; with crowded, normally concealed punctures. Scutellum small but distinct. Elytra elliptic-ovate, sides rather strongly rounded, base trisinuate and scarcely wider than base of prothorax; with rows of large, deep, partly concealed punctures; the odd interstices with slight tubercles supporting fascicles. Two basal segments of abdomen evenly convex, with crowded punctures. Legs moderately long, femora feebly grooved and edentate. Length, 5 mm.

Tasmania: Cradle Mountain, in January (A. M. Lea); unique.

In general appearance like some specimens of *Tapinocis corticalis*, but the forehead is distinctly sinuous. Structurally close to *E. conspiciendus*, but with the patch on the apical slope of that species much less conspicuous and of a dingier colour, the suture with a velvety patch in middle and another near apex, and the femora truly edentate. In the 1913 table of the genus (4) the small but distinct scutellum (which is clothed with rusty scales) and edentate femora, would associate the species with *E. occidentalis*, which is a smaller species, almost without fascicles. There are six small loose fascicles on the prothorax: two at apex and four forming a transverse row somewhat nearer the apex than base; on the elytra there are two dark fascicles on the suture, two on the third interstice on each elytron (the second one crowning the apical slope is dark in front and grey behind), three on the fifth, and three or four on the seventh, with a few less distinct ones elsewhere. On the pronotum there is a small glabrous central spot, but as it is finely punctate it may be squamose on fresh specimens.

EXITHIUS EDENTATUS sp. nov.

♂ Black, antennae and tarsi reddish, parts of elytra obscurely reddish. Densely clothed with dark greyish-brown scales, interspersed with numerous short, clavate setae, mostly black.

Head glabrous only at extreme base (normally concealed by prothorax). Eyes rather small. Rostrum slightly curved, not quite the length of prothorax, densely clothed almost to tip. Antennae inserted about two-fifths from apex of rostrum. Prothorax distinctly transverse, sides strongly rounded, apex about two-thirds the width of base; with crowded, concealed punctures. Scutellum absent. Elytra elliptic-ovate, sides moderately rounded, base feebly trisinuate; with rows of large, deep punctures, appearing much smaller through clothing. Two basal segments of abdomen large, with crowded, concealed punctures and a shallow median depression. Femora moderately long, edentate, and scarcely grooved. Length, 4·5 mm.

New South Wales: Mount Kosciusko, 5,000 feet (Dr. E. W. Ferguson); unique.

In the 1913 table of the genus could be associated with *E. tricarinatus*, which is a shorter and more robust species, with darker clothing. The mesosternal receptacle is suddenly elevated as on *E. loculosus*, *simulator*, and *fumosus*. It has the general appearance of *E. cyclothyreus* (now referred to *Ophrythyreocis*), but without the conspicuous scutellum of that species; and is slightly more compact than *E. stenocerus*, with the same dark, rusty-brown appearance, but

(4) Lea, Trans. Roy. Soc., S. Aust., 1913, p. 404.

antennae shorter. The upper-surface has a spotted appearance, owing to the dark setae being compacted to form feeble fascicles; of these there are six on the prothorax in the usual positions; on the elytra they are mostly placed in oblique series, of which there are two fairly distinct ones on each elytron, the first commencing near the shoulder and ending on the second interstice near the middle, and the second a short distance behind it. The clothing is so dense that the derm is normally concealed, but where some of the scales have been removed the elytra are seen to be of a dull red.

EXITHIUS SEMICALVICEPS sp. nov.

♀ Black, antennae and tarsi reddish. Densely clothed with muddy-grey scales, interspersed with setae.

Head with basal half bald and shining, the forehead sinuous in front, and with a short ridge continued to half-way between the eyes; these rather small. Rostrum moderately wide and slightly curved, basal third squamose, with a distinct median carina and two less distinct ones traceable through clothing, elsewhere shining and with small punctures. Antennae inserted about two-fifths from apex of rostrum, scape slightly longer than funicle. Prothorax distinctly transverse, sides strongly rounded, apex about half the width of base, surface uneven and with crowded, concealed punctures. Scutellum absent. Elytra distinctly wider than prothorax, shoulders rounded, sides thence parallel to about the middle, and then coarctate to apex, base rather strongly trisinuate; with rows of large, deep punctures, almost concealed by clothing, and with a few small, shining granules on suture. Two basal segments of abdomen large and convex, with small, concealed punctures, but a curved row of large ones near base. Femora rather long and distinctly grooved, tibiae rather thin. Length, 4 mm.

New South Wales: Ourimbah (Dr. E. W. Ferguson); unique.

With outlines much as on *E. conjunctus*, but suture without the conjoined fascicles of that species and clothing different. The rostrum is tricarinate, but not as in *E. tricarinatus* (with which it could be associated in the 1913 table of the genus), and the general outlines, etc., are very different. Where some of the scales have been removed parts of the under-surface are seen to be obscurely reddish. The setae on the upper-surface are mostly pale; they are longer and more erect on the elytra than on the prothorax; on the former there is a small black fascicle on the third interstice, at the summit of the apical slope, but the slight inequalities of the elytra are usually masked by the clothing. There is a feeble swelling of the ridge margining the groove on each femur at the normal position of a tooth, but the femora could not fairly be regarded as dentate.

EXITHIUS BIDENTATUS sp. nov.

♀ Black, antennae and tarsi obscurely reddish. Densely clothed with dark rusty-brown scales and setae, on the upper-surface slightly variegated with darker ones; with obtuse fascicles.

Head densely clothed except at extreme base. Eyes rather large. Rostrum moderately long and curved, sides gently incurved to middle, densely squamose near base, elsewhere shining and with crowded and moderately coarse punctures, becoming smaller in front. Antennae inserted slightly nearer apex than base of rostrum, funicle the length of scape, two basal joints of the latter elongate. Prothorax distinctly transverse, sides strongly rounded, apex scarcely half the width of base; with dense, normally concealed punctures. Scutellum distinct. Elytra parallel-sided to beyond the middle, base truncate, except that the shoulders slightly clasp the prothorax, apex distinctly notched; with rows of large, deep punctures, appearing much smaller through clothing, or quite concealed. Two basal segments of abdomen large, with dense, normally concealed punctures. Femora stout, strongly and acutely dentate, the front ones each with a small supplementary tooth in the notch; tibiae with outer edge gently arched. Length, 6·5–7·5 mm.

Victoria: Warburton, in January and April (F. E. Wilson).

In general appearance near *E. fumatus*, but elytra notched at apex, with conspicuous preapical callosities, and upper edge of tibiae outwardly curved, instead of gently incurved to middle. In the 1913 table of the genus it could be associated with *E. cyclothyreus*, but from that species, as from all others of the genus, it may be distinguished by the supplementary tooth on the front femora; this is more conspicuous on some specimens than on others, but is sufficiently distinct on all. On the prothorax six very feeble fascicles may be traced in the usual positions; on the elytra the fascicles are few in number, obtuse, and sometimes blackish, except that those crowning the preapical callosities are distinct. The rostrum has a shining median ridge, but it is inconspicuous on most of the specimens. A specimen from the Howitt collection in the National Museum (unfortunately without a locality label) is evidently a male of the species; it differs from the type and three other females in having the rostrum slightly shorter and wider, clothed to antennae, with coarser punctures and basal segment of abdomen flat in middle of base; the second, however, is quite as convex as on the females.

EXITHIUS SQUAMOSIS sp. nov.

Black, antennae and tarsi dull reddish. Densely clothed with soft and rather pale brown, slightly variegated scales, mixed with setae, the latter also forming fascicles.

Head densely squamose except on the normally concealed base. Rostrum comparatively wide and dilated at base, slightly shorter than prothorax, basal third densely squamose, elsewhere slightly shining and with fairly dense punctures, smaller along middle than elsewhere. Antennae inserted almost in exact middle of sides of rostrum, scape distinctly shorter than funicle, two basal joints of the latter elongate. Prothorax distinctly transverse, sides gently dilated from base to two-fifths from apex, and then strongly narrowed; with dense, concealed punctures. Scutellum absent. Elytra at base not as wide as widest part of prothorax, sides gently rounded to beyond the middle, base moderately incurved near each side for reception of hind angle of prothorax; with rows of large, setiferous punctures, more or less concealed by clothing; interstices tuberculate beneath fascicles. Two basal segments of abdomen large, gently convex; with dense, normally concealed punctures. Femora stout, moderately grooved, and feebly dentate. Length, 4·3–4·6 mm.

Queensland: National Park, in December. Type, in Queensland Museum; co-type, in South Australian Museum.

An aberrant species of the genus, but at present it does not appear desirable to propose a new one for its reception. In a table of some of the allies of *Poropterus* (5) it could be associated with *Hoplodecilaus*, but in *H. marmoratus* the shoulders are completely rounded off, and the clothing is thin and sparse. In many of its characters it approaches *Brachyporopterus* and *Bacodontocis*, but it is still more aberrant from them than from *Exithius*. In colour and general appearance it approaches *E. megapholus* and *ferrugineus*, but the prothoracic scales, although large, are much smaller than on the former species, and the latter has shoulders conspicuously produced. The femoral teeth are almost concealed by the clothing, but on close examination are sufficiently distinct; the front tibiae are feebly incurved on their outer edge, the others are arched there, with their apparent width exaggerated by the clothing. The two largest tubercles on each elytron are on the third interstice, one near the base, the other crowning the apical slope, but as the subbasal one is slightly the larger, the species, in the 1913 table of the genus, could be associated with *E. loculosus*, which is a shorter insect, with much darker clothing. The variegation of the scales is more pronounced on the apical slope than elsewhere, some of the scales there being almost black, and some of the stout setae being paler than the scales amongst which they are placed. There are six fairly large but obtuse fascicles on the pronotum, in the usual positions; on the elytra the fascicles are fairly numerous, but sparser on the odd than on the even interstices, the stout setae that are present on most of them appear more like erect scales than true setae. The scales on the abdomen

(5) Lea, Proc. Linn. Soc., N.S.W., 1913, p. 454.

and sides of prothorax are larger than elsewhere. Seen from the sides the surface of the elytra appears very uneven. The two specimens taken appear to be females.

EXITHIUS PARVIDENS sp. nov.

Black, antennae and tarsi obscurely reddish. Densely clothed with variegated scales, and short, erect setae.

Head densely clothed except at extreme base (normally concealed by the prothorax). Rostrum comparatively short and wide, basal third densely squamose, elsewhere somewhat shining, and with fairly coarse, crowded punctures. Antennae inserted slightly nearer base than apex of rostrum, scape distinctly shorter than funicle. Prothorax moderately transverse, sides strongly rounded, apex not half the width of base; with crowded, concealed punctures. Scutellum absent. Elytra rather wide, sides moderately rounded and widest about middle, base almost truncate except for scutellar notch; with rows of large, deep punctures, appearing much smaller through clothing; interstices slightly tuberculate beneath fascicles, the second, fourth, and sixth slightly dilated at summit of apical slope. Two basal segments of abdomen large, with crowded punctures, the first flattened in middle. Femora stout, feebly grooved, and feebly dentate. Length, 4·5 mm.

New South Wales: Eccleston (J. Hopson); unique.

In the 1913 table of the genus could be associated with *E. loculosus*, from which it differs in the more variegated clothing, with less conspicuous fascicles and shorter antennae. The oblique patch of white is suggestive of *E. obliquus*, but the type of that species is decidedly narrower, with the trisinuation of the base of elytra much more pronounced and the small fascicles more numerous. Each femoral tooth is but a slight of elevation of the ridge bounding the groove, rather than a distinct isolated one, and it is visible only on close examination. Most of the scales are of rather dark rusty-brown, becoming somewhat paler on the under parts; on the pronotum, the scales and setae (including six feeble fascicles in the usual positions) are mostly dark, but there is an ill-defined median patch of paler scales; on the elytra there is a V-shaped patch of almost white scales, extending from the middle of the suture towards the shoulders, but not reaching them; behind the white scales there are black ones, also obliquely placed, and some more black ones towards the apex; there are about seven blackish fascicles on each elytron, of which the longest is on the third interstice; there are also some brown ones. The type is probably a male.

EXITHIUS MICROPS sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with dark brown, feebly variegated scales and setae.

Head glabrous and with crowded punctures on basal half, forehead slightly sinuous in front. Eyes small. Rostrum the length of prothorax, moderately curved, with three ridges on basal half distinctly traceable through clothing, elsewhere with naked punctures. Antennae inserted about two-fifths from apex of rostrum, scape the length of funicle. Prothorax almost twice as wide as long, sides strongly rounded; with crowded, concealed punctures, and a short and feeble median ridge. Scutellum absent. Elytra slightly wider than prothorax at base, which is rather strongly trisinuate, sides gently rounded to beyond the middle; with rows of large, deep punctures, appearing small through clothing; with distinct, shining granules on each side of suture on basal half. Two basal segments of abdomen large, with comparatively small, concealed punctures, except for a curved row of large ones near base; first segment flat in middle. Femora stout, distinctly grooved, and feebly dentate. Length, 5·5 mm.

New South Wales: Mount Kosciusko (Dr. E. W. Ferguson); unique.

Of the size and general appearance of small specimens of *E. fumatus* (which also occurs on Mount Kosciusko), but eyes much smaller, subsutural granules much more conspicuous, and less of the head clothed. The forehead is slightly sinuous, and so, in the 1913 table of the genus, the species could be associated with *E. athyreus*, which is a larger one, with much stronger femoral dentition, and very different elytra; but regarding it as belonging to G, of that table, it could be associated with *E. stenocerus*, which is a narrower species, without conspicuous sutural granules. The prothorax is more transverse than is usual in the genus. There are some feeble clusters of dark scales or short setae on the prothorax and elytra, but the fascicles they form are ill-defined; the largest on each elytron is on the third interstice about the middle. There are eight granules on each side of the suture, but they are not placed symmetrically; the basal one on the left side is rather large. Both middle legs are missing from the type, but the others are not very distinctive.

On this and all the following species the mesosternal receptacle, although elevated above the adjacent parts (the insects viewed on their backs) is not abruptly so, although its upward slope is rapid.

EXITHIUS CARINICOLLIS sp. nov.

♂ Black, antennae and tarsi reddish. Sparsely clothed.

Head with forehead sinuous in front, bald behind. Eyes rather small. Rostrum more strongly curved than is usual in genus, the length of prothorax; with coarse, crowded punctures to apical third, where they are smaller and the surface is shining. Antennae inserted one-third from apex of rostrum, scape the length of funicle. Prothorax almost as long as wide, sides strongly rounded;

with coarse, crowded punctures and a distinct carina in middle. Scutellum absent. Elytra feebly trisinuate at base, sides rather strongly rounded and widest across middle; with rows of large, irregular punctures, the interstices separately convex, the alternate ones slightly elevated and irregular, the marginal one shining and impunctate. Under-surface with coarse, crowded punctures; two basal segments of abdomen large and depressed in middle. Legs rather long, femora grooved and moderately dentate, tibiae bisinuate on lower surface. Length, 3·0–3·2 mm.

♀ Differs in being more robust, rostrum less curved, with smaller punctures (but rather large and well-defined throughout and dense even at apex), antennae inserted not quite as close to apex of rostrum, and two basal segments of abdomen rather strongly convex.

Victoria: Warburton, from fallen leaves, in January (F. E. Wilson); Evelyn (C. Oke).

In the 1913 table of the genus could be associated with *E. stenocerus*, which is a larger species; with very different elytra. Each of the three specimens before me (two males and one female) is rather dirty and somewhat abraded; true scales are sparse and inconspicuous on the upper-surface, but from the sides sloping setae are evident, on the elytra they are mostly black and condensed on numerous slight swellings: on the pronotum of the female many of the setae are white, and appear to form six loose fascicles, but these are not evident on the males. Of the males the type has a conspicuous strip of reddish setae on the apical fourth of the suture and a short, whitish vitta on each elytron at the base, half-way between the suture and side; on a second male (returned to Mr. Oke) the suture is without special clothing, and the basal vittae of the elytra are larger and conspicuously reddish. On the head the clothing is of a rusty-red on two specimens, greyish on the other. The carina of the pronotum is about as long as the prothorax is wide, at its subapical constriction. On the males the slight swellings on the alternate interstices, combined with their clothing, cause some of them to appear transversely connected, giving the surface an appearance as of having large depressions like foveae, or of having long and deep punctures; on the female the surface is more uniform.

EXITHIUS INSULARIS sp. nov.

Black, antennae and tarsi reddish. Densely clothed with rusty-brown scales and setae.

Head with forehead bald, densely punctate, and slightly sinuous in front. Eyes not very large, and more convex than usual in genus. Rostrum moderately curved, the length of prothorax, sides gently incurved to middle; basal

third with scales concealed by clothing, elsewhere with crowded and moderately coarse punctures, becoming smaller in front. Antennae inserted slightly nearer apex than base of rostrum, scape slightly shorter than funicle, two basal joints of the latter elongate. Prothorax moderately transverse, sides strongly rounded, apex about two-thirds the width of base; with crowded, concealed punctures. Scutellum scarcely visible. Elytra elliptic-ovate, sides rounded and widest slightly beyond the middle, base moderately trisinuate; with rows of large, setiferous punctures, appearing smaller through clothing; interstices tuberculate or subtuberculate beneath fascicles, outer margin narrowly polished. Abdomen with crowded punctures; two basal segments large, the first feebly depressed in middle, its suture with second distinct at sides but obsolete in middle. Legs moderately long, femora feebly grooved and very feebly dentate, front tibiae with outer edge incurved to middle, middle ones angular near outer base, the hind ones straight except for basal curve. Length, 6 mm.

Tasmania: Adventure Bay on Bruni Island (A. Bovie); unique.

The trisinuation of the forehead is faint, but regarding the species as belonging to EE, of the 1913 table of the genus, it differs from *E. megapholus* in the much smaller scales, and from *E. athyreus* by its smaller size and very different elytra. Disregarding the forehead, it could be associated with *E. inamabilis* and *brevis*, each of which is a smaller and wider species, with darker clothing. In general appearance it resembles *E. ferrugineus*, but the scutellum is absent, and the shoulders are less conspicuous. The clothing is of almost uniform colour throughout, although some of the setae on the legs are whitish. On the pronotum there are six feeble fascicles in the usual positions. On the elytra the fascicles are fairly numerous on the odd interstices, and sparser on the even ones; the largest is on the third at the summit of the apical slope. The sex of the type is doubtful; by its abdomen it appears to be a male.

EXITHIUS EPISTERNALIS sp. nov.

Black, antennae (club somewhat darker than scape and funicle) and tarsi reddish. Densely clothed with rusty-brown and blackish scales and setae, most of the fascicles black.

Head with basal half bald and with crowded punctures. Rostrum moderately curved, the length of prothorax, basal half clothed, but with three fairly distinct ridges, elsewhere with crowded punctures, and with a feeble, shining median line. Antennae inserted about two-fifths from apex of rostrum, scape shorter than funicle. Prothorax distinctly transverse, sides strongly rounded; with crowded, partly concealed punctures. Scutellum absent. Elytra oblong-ovate, sides subparallel to beyond the middle; with rows of large punctures, appearing much smaller through clothing; fascicles supported on feeble

tubercles, margins not polished, a few sutural granules towards base. Under-surface with crowded punctures, two basal segments of abdomen large, the first with apex rather strongly incurved to middle. Femora stout, grooved, and moderately dentate; tibiae bisinuate on lower surface, the middle ones less noticeably than the others. Length, 5 mm.

Victoria: Belgrave and Noble Park (F. E. Wilson).

The metasternal episterna are thin but traceable throughout, an aberrant but not unique feature in *Exithius*. The femoral teeth are sufficiently large to entitle the species to be considered as belonging to J, in the 1913 table of the genus; of the species there noted *E. tenebrosus* is larger, with a stouter rostrum and the interstice on each side of the elytral suture thickened and shining at the base; from *E. obscurus* (which has very similar episterna) it differs in being smaller, with more numerous and evenly distributed fasciculate tubercles on elytra (almost as numerous as on *Microporopterus tumulosus*), with a few sutural granules, and rostrum more distinctly ridged. On the type the basal segment of abdomen is gently depressed in the middle; on a second specimen it is flat there; the rostrum is alike on both, and judging by it they are probably both males; the antennae, however, are inserted rather more distant from its apex than is usual in males. There are six feeble fascicles on the pronotum in the usual positions, the outer one of the subapical series is brown, there is also a small brown spot at the middle of the base; there are about twenty small fascicles on each elytron, more numerous on the odd than on the even interstices. The bald part of the head is normally concealed by the prothorax.

EXITHIUS PULLATUS sp. nov.

♂ Black, antennae and claw-joints dull reddish. Densely clothed with dark brown and sooty scales and setae.

Head with basal half (normally concealed by prothorax) bald and with crowded punctures. Eyes rather small. Rostrum moderately curved, slightly shorter than prothorax, sides incurved to middle, and notched on each side of base; basal half densely clothed, elsewhere with crowded and rather coarse punctures. Antennae inserted slightly nearer apex than base of rostrum, scape shorter than funicle. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base; with crowded punctures more or less concealed by clothing. Scutellum absent. Elytra oblong-ovate, sides subparallel to beyond the middle, base trisinuate; with rows of large punctures, appearing much smaller through clothing; a few small granules near suture. Under-surface with crowded but mostly concealed punctures, two basal segments of abdomen large, the first flat in middle. Femora stout, feebly grooved, and (especially the middle and hind ones) feebly dentate. Length, 4·3–4·5 mm.

♀ Differs in having the rostrum slightly longer, less clothed, antennae inserted further from apex of rostrum, and two basal segments of abdomen gently convex.

Victoria: Evelyn, in June (C. Oke).

In general appearance close to *E. fumatus*, but average size consistently smaller; the incurvature of the outer edge of the tibiae is much the same. Also smaller than *E. simulator*, and trisinuation of base of elytra pronounced, and prothoracic clothing less variegated. Structurally close to *E. loculosus*, but slightly narrower, and base of elytra more noticeably trisinuate. The femoral teeth are small and traceable with difficulty (but the front ones are more distinct than the others), so the species, in the 1913 table of the genus, could be associated with *E. inamabilis* and *brevis;* the former has less parallel-sided elytra with fewer fasciculate tubercles, the latter is even more compact, with punctures of two basal segments of abdomen distinctly larger and less crowded. All the setae and fascicles on the upper-surface are black; most of the scales are also black, but some are dark brown or ashen; on the sides of the mesosternum, metasternum, and basal segments of abdomen most of the scales are brownish. The setae on the pronotum are compacted to form four irregular lines from base to apex, rather than loose fascicles, but many are scattered singly. There are many fascicles supported by small tubercles on the elytra, more on the odd than on the even interstices; but none conspicuously larger than the others; from some directions they appear to be placed in oblique rows. A specimen from Millgrove (in December, F. E. Wilson) appears to be a female of this species, but differs in having scarcely visible femoral teeth, and elytral fascicles more uneven, two on the third interstice (one near base and one crowning the apical slope) being larger than the others. A male from Ringwood (in June, F. E. Wilson) appears also to belong to the species, but is too much abraded for certainty.

EXITHIUS TRICARINATUS Lea.

A specimen from an elevation of 5,000 feet on Mount Kosciusko evidently belongs to this species, but is less densely clothed than the type (probably due to abrasion), and with the polished margin of each elytron somewhat wider. Mr. F. E. Wilson has a specimen from Lorne (Victoria), also evidently belonging to the species, but with the fascicles more pronounced.

EXITHIUS OBLIQUUS Lea.

Two specimens, from Barrington Tops (New South Wales), evidently belong to this species, but are without the latero-basal black markings on the pronotum of the type (on several others these are ill-defined or absent); the oblique rows

of fascicles on the elytra ending near the suture, at the summit of the apical slope, are as on the type, but behind them, except about the apex itself, the scales are sooty-black, and in front of them the pale scales cover a larger area than on the type.

OPHRYTHYREOCIS FASCICULATUS sp. nov.

♂ Black, antennae and tarsi reddish, apex of rostrum obscurely diluted with red. Densely clothed with variegated scales and setae.

Head with base bald and densely punctate, but normally concealed by prothorax; forehead sinuous. Eyes small. Rostrum moderately curved, slightly shorter than prothorax, sides incurved to middle; with crowded punctures on apical half, concealed by clothing elsewhere. Antennae inserted about one-third from apex of rostrum. Prothorax almost as long as wide, sides strongly rounded, apex scarcely half the width of base; punctures normally concealed. Scutellum conspicuously elevated and of a waxen appearance. Elytra about twice the length of prothorax and scarcely wider at base (which is almost truncate), sides strongly rounded and widest at basal third; with rows of large, deep punctures, appearing much smaller through clothing, tuberculate beneath fascicles. Basal segment of abdomen large, slightly flattened in middle. Femora feebly grooved and scarcely visibly dentate; tibiae gently incurved to middle on outer edge. Length, 2·5–3·0 mm.

♀ Differs in having the rostrum longer, thinner, clothed only near base, antennae inserted two-fifths from apex of rostrum and basal segment of abdomen convex.

Victoria: Belgrave, in ferns and leaf debris in January (F. E. Wilson), in April (C. Oke and Wilson); Evelyn (Oke).

Readily distinguished from all previously described species by the fascicles at summit of the apical slope, but the following species resembles it in this respect, although not in others. The eyes are almost as prominent as on *O. exopthalmus*. The type is in perfect condition, and is densely clothed with scales and setae varying from almost white, through shades of rusty-brown, to black; on the pronotum, about half of the scales are greyish-white, and there are six loose fascicles in the usual positions; on the elytra most of the scales are rusty, but there are some blackish ones near the base, and others near the apex; there are numerous small fascicles, but two large ones near the suture crowning the apical slope; the legs are conspicuously variegated. A female is similarly clothed, except that the black scales and setae on the elytra are less numerous, and the legs are less variegated. Three other males and one female differ from the types in having the clothing much less variegated, being mostly of a muddy-grey, variegated with dingy-brown and with a few dark setae; the fascicles

crowning the apical slope are distinct on all of them, and there are usually small basal fascicles; on two of the males the suture on the apical slope is conspicuously whitish; another female is still dingier, its clothing being almost uniformly muddy-grey; but the differences are probably due to partial abrasion and to a slight amount of mud, which so commonly adheres to specimens taken from fallen leaves. The rostrum has a shining median line, that is longer and more distinct on the female than on the male. The femoral teeth are so minute that the femora might fairly be regarded as edentate.

OPHRYTHYREOCIS VIGILANS sp. nov.

Black, antennae and tarsi obscurely reddish. Densely clothed with rusty-brown scales and setae, infuscated on each side of base of prothorax and on part of apical slope.

Head with base concealed but forehead not sinuous. Eyes comparatively large and round. Rostrum moderately curved, slightly longer than prothorax, rather more than basal third squamose, elsewhere shining and with small but distinct punctures. Antennae inserted two-fifths from apex of rostrum, scape the length of funicle. Prothorax moderately transverse, sides strongly rounded, apex about three-fourths the width of base; with a feeble median line and crowded, concealed punctures. Scutellum conspicuous, with a waxen coating. Elytra with base (except for scutellar incurvature) almost truncate, shoulders not clasping prothorax, sides rounded and widest just before middle; with large punctures, appearing much smaller through clothing, tuberculate beneath fascicles. Two basal segments of abdomen large and evenly convex. Metasternal episterna narrow but distinct. Femora feebly grooved and edentate, tibiae straight except at base. Length, 5–6 mm.

Western Australia: Manjemup (H. J. Carter), Pemberton (Dr. E. W. Ferguson).

With the conspicuously elevated scutellum of *Ophrythyreocis,* but the eyes are larger than usual and the mesosternal receptacle is almost open. The setae are sloping and numerous on the upper-surface, and dense on the legs; but on three specimens the suture is glabrous at the base, on a fourth it is sparsely clothed there. There are six fascicles on the prothorax in the usual positions, the two apical ones being rather feeble; on each elytron there are three fascicles on the third interstice, of which the third is slightly larger than the others, and crowns the apical slope; there are three somewhat smaller ones on the fifth, and five or six still smaller ones on the seventh; in addition there are some even smaller ones scattered about, especially on the apical slope. The four specimens examined appear to be all females.

OPHRYTHYREOCIS NIGER sp. nov.

♂ Black, antennae pale red, tarsi darker. Densely clothed with sooty scales and setae.

Head bald, and with crowded, concealed punctures on basal half; forehead sinuous in front. Eyes small. Rostrum moderately curved, about the length of prothorax, clothed to antennae; in front with crowded and rather coarse punctures. Scape inserted one-third from apex of rostrum, the length of funicle. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base; with large, crowded punctures. Scutellum distinct. Elytra about twice the length of prothorax, base almost truncate, sides rather strongly rounded and widest about middle; with rows of large, partly concealed punctures; interstices in places subtuberculate, each marginal one polished. Two basal segments of abdomen large, flattened in middle; with large, crowded punctures. Femora shallowly grooved, and very feebly dentate, tibiae gently bisinuate on lower surface. Length, 3·0–3·5 mm.

♀ Differs in having the rostrum somewhat longer and thinner, less of the base clothed, with a shining median line, antennae inserted less close to apex of rostrum, and two basal segments of abdomen gently convex.

South Australia: Mount Lofty Ranges, in tussocks (N. B. Tindale), in October (F. E. Wilson).

Distinct from all the previously named species by the sombre clothing. On two of the five specimens before me some of the scales and setae on the head and prothorax are ashen-grey, but on the others they are all black; the setae are clavate and sloping or gently curved, they do not form distinct fascicles, but in places are loosely compacted. They appear to be all somewhat abraded, but the waxy coating of the scutellum is in good condition.

OPHRYTHYREOCIS ALTERNATUS sp. nov.

♂ Black, antennae and tarsi reddish. Densely clothed with rusty-brown and black scales and setae.

Head with concealed basal fourth glabrous, and with dense punctures, forehead almost evenly curved. Eyes small. Rostrum rather stout and moderately curved, scarcely the length of prothorax, clothed almost to apex. Antennae inserted one-third from apex of rostrum, scape the length of funicle. Prothorax moderately transverse, sides strongly rounded, apex about half the width of base; with crowded, partly concealed punctures. Scutellum small but distinctly elevated, with a waxy coating. Elytra elliptic-ovate, not much more than twice the length of prothorax, sides gently rounded and widest at basal fourth, base gently incurved between scutellum and shoulders, which slightly clasp the prothorax; with rows of large, deep, partly concealed punctures. Under-surface

with crowded and moderately long punctures; two basal segments of abdomen large, the first gently concave in middle. Femora feebly grooved and feebly dentate, tibiae gently bisinuate on lower edge. Length, 4·5–5·0 mm.

♀ Differs in having the rostrum slightly longer, thinner, less curved, and with punctures not concealed, except on basal third, antennae inserted slightly more distant from apex and two basal segments of abdomen evenly convex.

New South Wales: Rule's Point, in February (H. J. Carter).

The general appearance is like that of *O. cyclothyreus,* but on that species the shoulders do not clasp the prothorax, and the scutellum is somewhat larger. It is like *O. ferrugineus,* on an enlarged scale. *O. valgus* is slightly larger, with the front tibiae more incurved, etc. It is of the size and general appearance of *Achopera alternata,* but the special clothing of the alternate interstices is on the even instead of the odd ones, and the scutellum and many other parts are different. On the upper-surface and legs the black scales and setae form numerous small spots; the setae are rather short, stout, and suberect, on the elytra (except about base and apex) they are confined to the even interstices, on which they are crowded, or in irregular double rows.

OPHRYTHYREOCIS TIBIALIS sp. nov.

Obscurely reddish-brown, antennae paler. Densely clothed with pale and rusty-brown scales and setae, variegated with dark brown ones.

Eyes of moderate size. Rostrum gently curved, slightly shorter than prothorax, punctures concealed only near base, rather coarse and sublineate in arrangement behind antennae, crowded and smaller in front, but with a shining median line almost throughout. Antennae inserted two-fifths from apex of rostrum, scape slightly shorter than funicle, first joint of the latter almost twice the length of second. Prothorax slightly shorter than wide, sides strongly rounded, apex about half the width of base; with crowded, partly concealed punctures. Scutellum small but distinctly elevated, with a waxy coating. Elytra subovate, about twice the length of prothorax, base truncate, sides strongly rounded and widest at basal third; with large, partly concealed punctures; outer margins polished. Under-surface with crowded punctures; two basal segments of abdomen large and gently convex. Middle and hind femora feebly dentate, the front ones edentate. Length, 3·5 mm.

Victoria: Fern Tree Gully, from moss, in April (F. E. Wilson).

With the general appearance of *O. ferrugineus,* but without the spots of black scales; it is, however, very distinct by the mesosternal receptacle being U-shaped, scarcely elevated, and with thin walls; on *ferrugineus* it is noticeably elevated (with the insect on its back), with a median ridge. In general appearance is still nearer to *O. exopthalmus,* but the eyes are larger and much

less prominent, the mesosternal receptacle is longer and with thinner walls. In my table of the genus (6) it could be associated with *O. microps*, which is a smaller species, with muddy-brown clothing and smaller eyes. The type is probably immature, as on all other species the derm is black. The setae on the prothorax are loosely compacted, and may be considered as forming six feeble fascicles in the usual positions; on the elytra there are numerous loose fascicles, irregularly distributed, but more than half of them are composed of dark setae. On the type (which appears to be a female) the base of the head is concealed by the overlapping prothorax. The tibiae are gently incurved to middle on the upper edge, but appear rather strongly so, as the setae are subfasciculate at the base and apex.

OPHRYTHYREOCIS CYCLOTHREUS Lea (formerly *Exithius*).

On this species the scutellum has a waxy-looking coating, and is elevated above the adjacent parts; it was overlooked when the genus *Ophrythyreocis* was named, but I think should be referred to it. Its forehead is not sinuous, the elytra are thrice the length of the prothorax, and the third and fourth segments of abdomen are not below the level of the fifth; but these characters are of less importance than the scutellum.

OPHRYTHYREOCIS MICROPS Lea.

The type of this species is a female from an unknown locality. Mr. F. E. Wilson has recently taken several specimens on the Bogong Plains (Victoria), in January, at an elevation between 5,000 and 6,000 feet. They are all slightly larger than the type, varying from 2·8 to 3·0 mm. The male differs from the female in having the rostrum shorter and wider, clothed to beyond the middle, with punctures on the naked portion coarser, and antennae inserted somewhat nearer the apex. The species is somewhat smaller than *O. niger*, with rusty clothing and prothoracic punctures smaller; it is less brightly clothed than *O. tibialis*, and with smaller eyes.

ROPTOPERUS LISSORHINUS sp. nov.

Dark brown, rostrum and tarsi reddish, antennae paler. Densely clothed with light brown, feebly variegated scales; and with stiff setae, forming fascicles on the tubercles.

Rostrum about the length of prothorax, rather wide, feebly curved, basal fourth squamose, elsewhere highly polished and with minute punctures. Antennae inserted about one-third from base of rostrum. Prothorax longer than wide, sides rounded and widest across middle, with feeble tubercular elevations

(6) Lea, Trans. Roy. Soc., S. Aust., 1913, p. 246.

across middle and near base; with crowded punctures. Elytra elongate-cordate, base trisinuate, the sinus near each shoulder for the reception of a basal angle of prothorax, greatest width slightly before the middle, which is almost twice the width of base of prothorax; strongly striate-punctate, odd interstices tuberculate. Femora edentate. Length, 3 mm.

Tasmania: Cradle Mountain, in moss (A. M. Lea); unique.

Fairly close to *R. bryophilus*, but prothorax narrower and tubercles differently placed. The scape and basal half of funicle are almost flavous. From directly above the setae (except on the tubercles) are inconspicuous, but they are distinct from the sides. The base of the head is shining and finely, transversely striated (for stridulation), but would be concealed on "set" specimens. The prothoracic tubercles are very feeble, and could fairly be regarded as but slight inequalities of the surface; on the elytra they are more distinct, there are three on the third interstice: one near base, one (the only one crowned with black setae) just before middle, and the third half-way between the second and apex; two smaller ones on the fifth interstice, and three on the seventh; but there are other slight inequalities of the interstices. The type appears to be a female.

ROPTOPERUS CARINATUS sp. nov.

♂ Dark brown, glabrous part of rostrum, antennae and tarsi almost flavous. Densely clothed with pale muddy-brown scales, interspersed with setae.

Rostrum slightly shorter than prothorax, moderately wide, slightly curved, apical third polished and with small punctures, elsewhere densely clothed. Antennae inserted slightly nearer base than apex of rostrum. Prothorax slightly shorter than the basal width, which is less than that of middle, with two slight inequalities at apex, four across middle and four near base; with crowded, partly concealed punctures. Elytra distinctly wider than prothorax at base, shoulders rounded off, greatest width before the middle; with numerous small tubercles, of which the largest are on the third interstice, each shoulder with a shining carina (invisible from above) half the length of prothorax; irregularly striate-punctate. Femora stout, edentate. Length, 3·0–3·5 mm.

♀ Differs in having the rostrum slightly longer, thinner, more curved, clothed only on basal third, antennae inserted nearer base of rostrum, and abdomen more convex.

Victoria: Millgrove, in January; Warburton, in January and March; and Ferntree Gully, in July, all from moss (F. E. Wilson).

A compact species, readily distinguished from all others of the genus by the carina on each shoulder; this, however, could be easily overlooked unless the sides are viewed at right angles.

TRACES OF AN EXTINCT ABORIGINAL POPULATION ON KANGAROO ISLAND

By NORMAN B. TINDALE AND BRIAN G. MAEGRAITH, M.B., B.S.

Figs. 1-11.

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INTRODUCTION.

WHEN Matthew Flinders (1), the navigator, first landed on Kangaroo Island, in the year 1802, he found that the native animals were so unmindful of human beings that they could be approached and slaughtered with ease. "The extraordinary tameness of the kanguroos and the presence of seals upon the shore concurred with the absence of all traces of men to show that it was not inhabited."

Baudin (2), who visited the island later in the same year, also remarks: "Nulle trace du séjour de l'homme ne se fait remarquer sur les rivages qui nos occupent. . . . ."

Just before or shortly after these voyages of discovery, wandering sealers, whalers, and (after 1803) escapees from the newly opened convict settlements in Tasmania began to visit and eventually to settle on the island, bringing with them a limited number of native women, a few from Tasmania, some from the adjoining mainland, and others from Eyre Peninsula. From time to time this resident population was augmented by temporary visitors, but it was not till 1836 that the first official settlers landed and inaugurated the modern period of development.

The resident population during the earlier part of last century was small, and the principal areas occupied by them are well known. The following statements of the mixed population are based on the researches of Moore (3), and Berry (4), and on information supplied by old inhabitants, whose knowledge dates back to 1864.

Year.	Men (Europeans).	Women (Tasm. & Aust.).	Comments.
1806	7	—	Murrell's party
1810	2	3	
1815	2	3	
1820	3	—	
1825	3	6	
1827	7	7	
1830	7	—	
1831	18	—	Capt. J. Hart's rept.
1834	7	5	Capt. J. Jones's rept.
1835	7	—	
1844	—	12	S.A. "Register" (25.9.1844)
1864	—	3	
1870	—	3	

NAT. MUS. MELB.

In 1826, according to the "Hobart Town Gazette" (12.2.1826) the total population, including many half-caste children, was about forty. They lived inland from Nepean Bay, where they had a garden and huts. After 1836 the white men and their progeny tended to merge with the new settlers, but the evidence of their mixed origin is still apparent, and most of the old family names survive on the island.

The native women introduced by the early white inhabitants were employed in agriculture after the European manner, and also in snaring animals and preparing the skins for export. The scant archaeological traces of this occupation are moderately well known, consisting mainly of crude grain-mills, metal try-pots, and primitive agricultural implements.

A century after the first discovery of Kangaroo Island, Howchin ([5]) directed attention to the presence of eight hammer-stones at Hawk's Nest, indicating former human occupation. He considered that some quartz flakes from among the sandhills of the coast, and a mound of broken shells on top of the headland at the east side of the bay at the Brecknell's, were additional evidence of occupation.

About 1922 Mr. W. Ham found a further hammer-stone in dense scrub on the high bank to the north of Murray's Lagoon.

In 1930, during the course of a soil survey at Hawk's Nest, conducted for the Commonwealth Nutrition Laboratory by Mr. R. G. Thomas, B.Sc., interest was stimulated by the discovery of additional hammer-stones. As a consequence detailed examination seemed desirable, and the writers, accompanied by Dr. W. Jolly, visited the locality as the guests of Major H. W. H. Seager and Mr. E. C. Seager, owners of Hawk's Nest Station.

In the following pages the Hawk's Nest occurrence is discussed in detail, after which brief records of some other localities, some corrections in a previous account, and a general discussion, are given.

THE HAWK'S NEST SITE.

Hawk's Nest Station comprises Section 4, Hundred of Macgillivray (137° 27′ East Long. x 35° 53′ South Lat.). The homestead block is situated on the north-eastern shore of Murray's (originally Murrell's) Lagoon, a shallow fresh-water lake without apparent outlet to the sea. This lagoon receives the waters of Timber Creek from the north-east and of Curley Creek from the north-west.

At the present day the lagoon is frequented by waterfowl, especially black swans *(Chenopsis atra)*, which nest on a small island situated in the western half.

At least two species of small fresh- or brackish-water Gasteropods are present: one, *Bulinus rubidus*, is not very common; the other, *Coxiella badgerensis*,

is abundant. Two or more species of lime-depositing algae, probably allied to *Chara*, are also abundant. During periods of drought, when the area of water is much reduced by evaporation, strong south-westerly gales blow the lime dust and *Coxiella* shells from the drying edges of the lagoon towards the north-east, where they accumulate as a shell beach on the margin of vegetation. In time these deposits become consolidated as a soft shelly limestone. This process, repeated over long periods, has built up deposits over much of the area of Hawk's

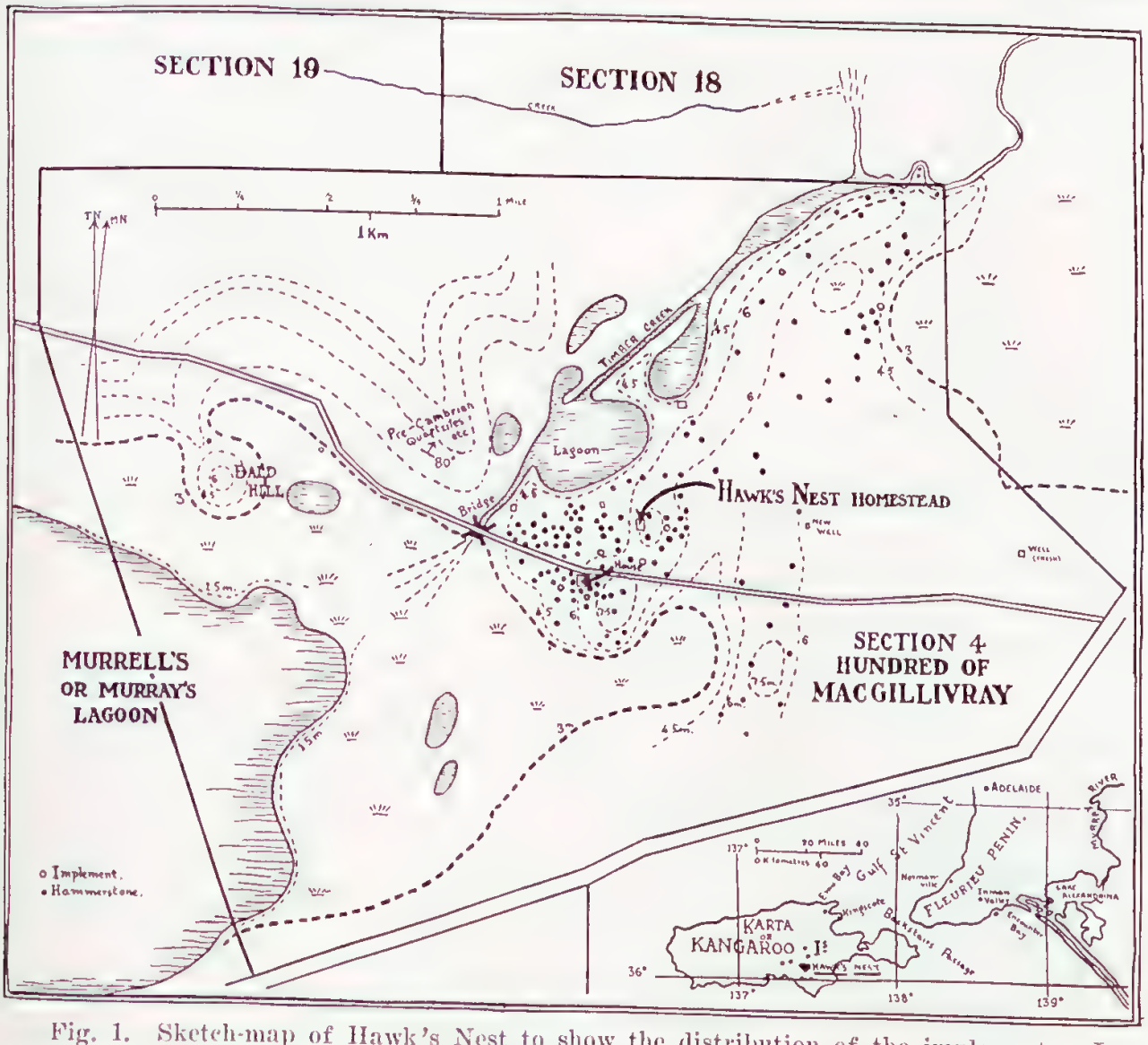


Fig. 1. Sketch-map of Hawk's Nest to show the distribution of the implements. Inset shows Kangaroo Island and the adjoining mainland.

Nest. All stages can be detected, from the compact *Coxiella* limestone forming the uplands, upon which the station houses are built, to the recently accumulated shell heaps on the present shores.

In the accompanying sketch map the contours of the area in the immediate vicinity of Hawk's Nest are roughly indicated, the floor of the lagoon being utilized as datum.

In times of flood the lagoon is 1·5 metres deep, and covers an area of approximately 6 square kilometres. Once only since 1864, when records were first commenced, has the lagoon level risen to between the 3 and 4 metre contours. This happened in 1910, a year of exceptional rains, when the area of the lake must have been at least 10 square kilometres.

The uplands of Hawk's Nest are undulating knolls of lake limestone thinly covered with soil. They have been cleared of their original vegetation for many years, and in some areas have been ploughed for the sowing of wheat, barley, etc. Other areas have recently been rolled to destroy the scrub, ploughed, and sown with native grasses. Areas so treated include part of the swamp-land below the 3 metre form line, some of the higher ground north-east and south-west of the homestead, and a large area of undulating limestone country to the south-east. This matter has been referred to in some detail, because the hammerstones and other artefacts referred to below are usually concealed in the top 0·3 metre of soil, so that, except where there has been natural erosion of the surface mantle, they are only brought to the surface by the plough.

The implements are not associated with the usual signs of recent occupation, such as ashes, charcoal, ruddle, bone and shell fragments, etc. Some burnt pieces of lake limestone (such as are often found associated with cooking ovens on mainland sites) are also ploughed up; but it is difficult to decide whether in any particular instance they are likely to be oven-stones or stones burnt naturally as the result of bushfires.

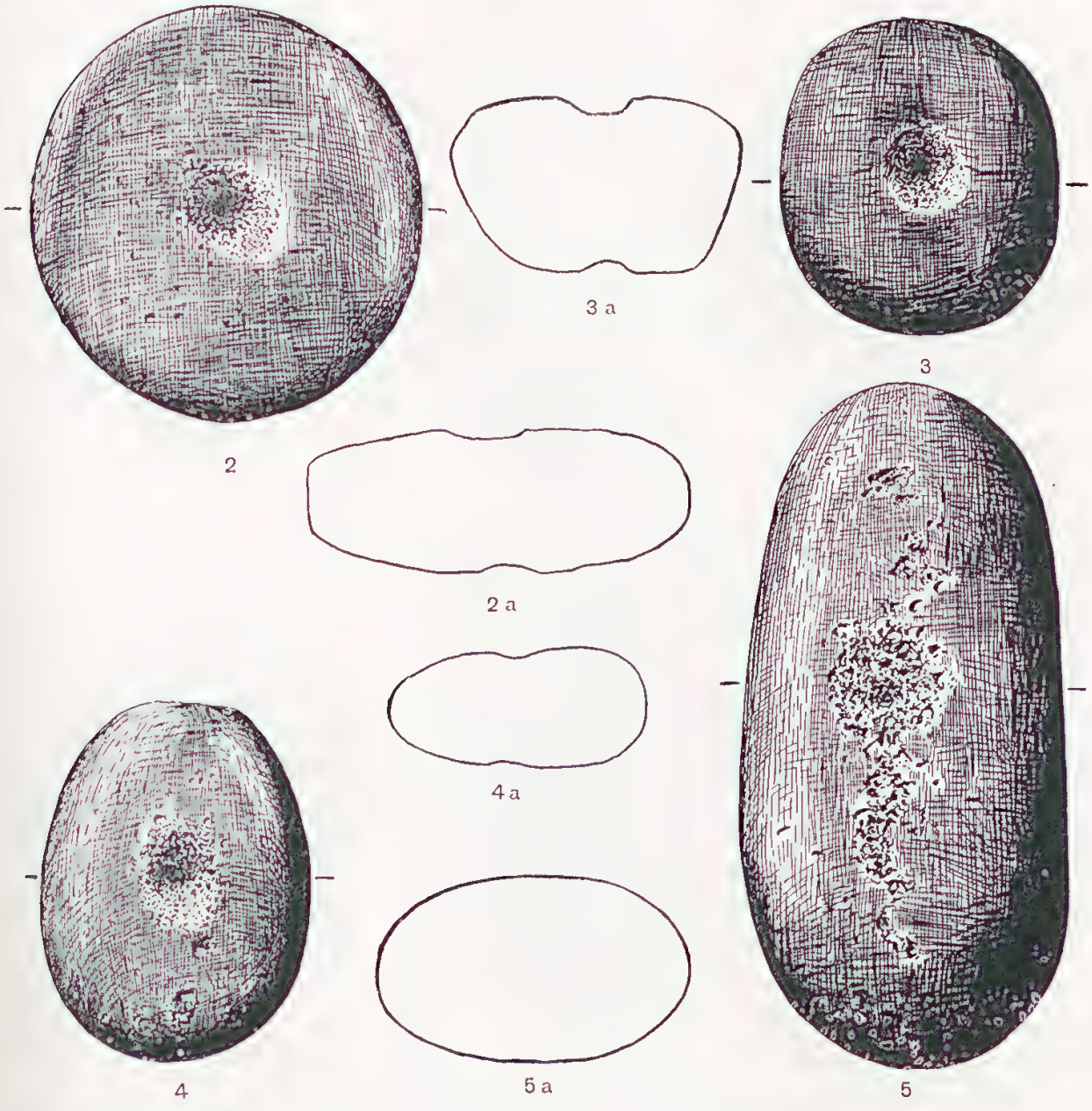
The sketch map gives the distribution of the most definite implements and artefacts found. Each dot represents a hammer- or mill-stone; the circles indicate trimmed flakes or "cleavers," and "cores." Approximately 6 square kilometres of the country examined was found to present these remains.

The lowest limit of the occurrence of these objects appears to correspond to the 3 metre form line. They are present on all of the higher ridges between the swamp-lands on Murray's Lagoon on the south-west and the swamp-lands of Section 18 to the north-east. They are most numerous on the peninsula formed by the upland at the mouth of Timber Creek, above the 4·5 metre form line. No specimens were found on the stony outcrops of Pre-Cambrian quartzites to the north-west of the creek. According to Mr. E. Seager they are also absent from the limestone country on the south-eastern boundary of Section 4, but as this area was under crop during our stay it could no be closely examined.

ARTEFACTS.

The materials from which the implements found at Hawk's Nest are manufactured are chiefly waterworn pebbles of grey, brown, or pink quartzite and

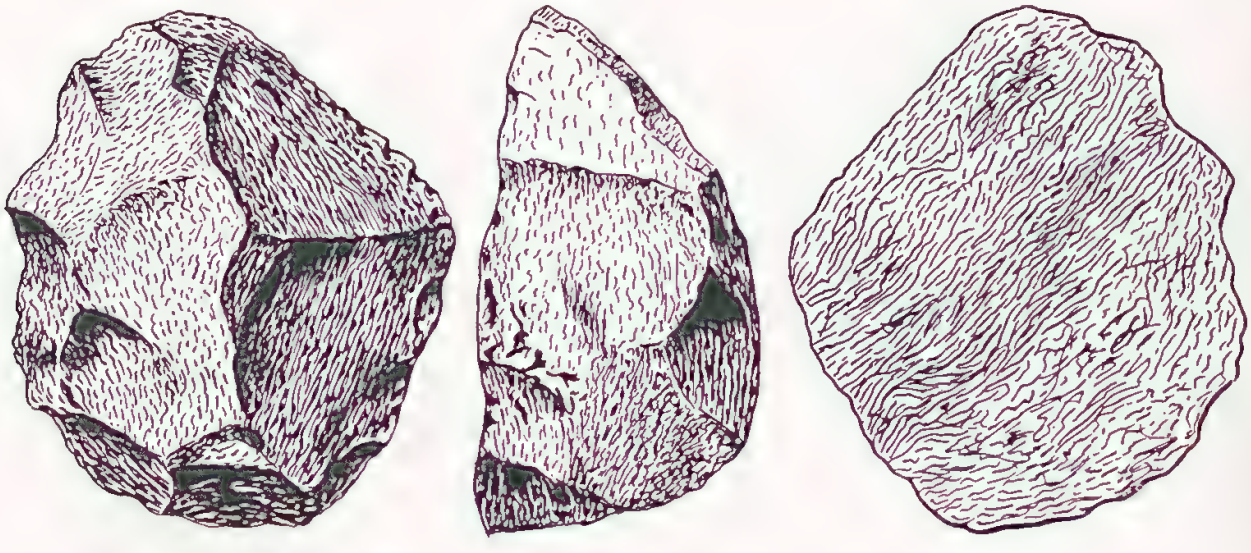
quartz, all of which are foreign to the locality. With one doubtful exception they must all have been transported at least 35 kilometres, for the nearest known sources of supply are near Kingscote and Emu Bay, on the north coast of the island.



Figs. 2-5. Hammerstones from Hawk's Nest, Kangaroo Island, 0·4 nat. size.

Approximately 70% of the pebbles present at Hawk's Nest bear some indication of human utilization, principally in the form of the pitting and bruising, due to their use as hammer-stones. On about 50% of the utilized examples sufficient wear has taken place to enable them to be classified according to mode of use, etc. Only the locations of the latter examples are shown on the sketch map (fig. 1). Many of the stones are broken across by thermal or other natural agency; others

show the freshly executed effects of contact with the ploughshare which brought them to the surface. A selection of about fifty of the best preserved and most typical examples has been placed in the Museum collection, and a large collection of the poorer examples has been deposited at Hawk's Nest Station.



6a 6b 6c

7a 7b 7c

Figs. 6-7. Trimmed flakes, or *árapia*, from Hawk's Nest, Kangaroo Island, 0·6 nat. size. For explanation of the term *árapia* see p. 286.

Associated with the hammer-stones were some trimmed discoidal flakes of large size and numbers of the "core"-like objects described below. No evidence of the utilization of small secondarily chipped flakes was discovered.

Hammer-stones. Four special types of hammer-stones are particularly common, but by selection from the long series obtained all gradations of form are to be seen. It will therefore be sufficient to describe and illustrate the most

characteristic forms. Hammer-stones range from 0·5 to 1·5 kilograms in weight. The types are: (a) Flattened discoidal stones with marked peripheral wear and axial depressions on each face (probably due to use as nether blocks) (fig. 2). (b) Oval stones usually somewhat less flattened than the discoidal type, possessing well-battered areas at the extremities, also axial depressions on the flatter faces (fig. 3). (c) Oval stones showing marked hammering effects at one or both extremities (fig. 4). (d) Elongate-oval stones with the principal signs of use at the centre and the two extremities of the flat faces (fig. 5).

In addition to these regular types and the intermediates there are some irregular pebbles showing marked signs of use.

Nether Stones. Apart from the true hammer-stones there are numbers of larger flattened oval or discoidal stones up to 5·5 kilograms in weight. These bear evidence of use as nether stones in the form of axial abrasions or depressions on one or both of the principal faces.

Trimmed Flakes. Numbers of large flakes, roughly fashioned to a discoidal shape by a series of blows at right angles to the plane surface, were present. Secondary chipping is evident on portions at least of the periphery. Fig. 6 shows an example 9 cm. in diameter and 4 cm. in thickness. The material is a coarse, pink-coloured felspathic quartzite. Another example, illustrated in fig. 7, is 8 cm. in diameter and 4 cm. in thickness. In this the material is similar to a grey quartzite found outcropping to the west of Hawk's Nest. It is the only implement which may have been made of rock occurring in the neighbourhood.

Trimmed Cores. Two types of large "core"-like implements are somewhat more abundant than the trimmed flakes. They possess a flat face, which may be either circular (type *a*) or elongate-oval (type *b*) in outline; and a very high back. The circumference shows marked secondary chipping of a coarse order. Indications of wear are shown in the blunting of the secondarily chipped margin, which may be contrasted with the equally acute but unabraded ridges and keels on the back and sides.

A typical example of type *a* is shown in fig. 18. The first illustration gives a lateral view, in the second the stone has been tilted backwards to show the flat surface and the abraded working margin. The example is 9 cm. in diameter and 9 cm. in height, and is made from a medium-grained dark quartzite which is foreign to the locality.

The elongate-oval implements (type *b*) are uncommon. The best example is illustrated in figs. 9 *a-c*, which show respectively the dorsal, lateral, and ventral aspects. It measures 14 cm. in length, 7 cm. in width, and 5 cm. in height. The flat face is part of the original surface of the fine-grained quartzite pebble from which it was fashioned, and bears three groups of pittings as a result of use as

a hammer-stone. Secondary chipping occurs at both ends and along one lateral margin. The working edge is only moderately abraded.

8 a

8 b

9 a

9 b

9 c

Figs. 8-9. Trimmed core-like implements from Hawk's Nest, Kangaroo Island, 0·6 nat. size.

BRIEF RECORDS OF OTHER LOCALITIES.

Kaiwarra: During a visit to the South Coast an hour was spent at Kaiwarra, or Mount Pleasant Station (Section 8, Hundred of Seddon). The station house is situated on a lake-limestone rise forming the north-eastern bank of a flood plain inundated by the Eleanor River. The swamp-land in the depression has been artificially reclaimed by means of a weir, which diverts the river southward into a new channel.

A section dug near the house at a height of about 6 metres above the swamp shows:

Grey sandy soil	0·2 metre
Lake limestone with *Coxiella* remains ..	0·7 metre
Marl with irregular land surface	2·0 metres

This section suggests that there has been a recent period of lake extension, following a drier period, during which an eroded land surface was formed.

Three hammer-stones were picked up on stone dumps near the house. Mr. Buck, the present owner, stated that he had met with others when ploughing the drained swamp half a mile west of the house; we were unable to locate these in the short time available.

Lake Ada: An inferior hammer-stone example was picked up on an eroded surface on the rise to the north-east of Lake Ada, near the abandoned house known as "Ford's."

Macgillivray: Mr. J. Wood stated that he had seen several hammer-stones on some high land overlooking the Upper Timber Creek, about 8 kilometres north of Hawk's Nest (Section 23, Hundred of Macgillivray); a single portion of a hammer-stone was also noted by us beside the track on the southern boundary of Redlands Station (Section 3, Hundred of Macgillivray).

Salt Lagoon: Mr. A. G. Boxer discovered several excellent hammer-stones at his station on the north-eastern bank of Salt Lagoon, 2 kilometres west of the Bay of Shoals, and has presented them to the South Australian Museum. All the examples were said to have been located on uplands at a height of perhaps 9 metres above the level of the lagoon and 100 metres from its present margin.

Other possible sites: Two old residents of Kingscote remarked that similar stones occur at Rocky river on high ground, at Cape De Couëdic, and at the eastern end of Eleanor River. An inferior hammer-stone was found by us beside a camper's cottage, near the mouth of Harriet River, Vivonne Bay. This may have been carried from some site in the vicinity.

A Correction. A detailed examination was made of the "kitchen midden" recorded by Howchin ([5]) as existing on the top of the headland at the east side

of the bay at the Brecknells (Five Beaches). Associated with the older shells forming this mound are fresher ones, in a few cases still containing decomposing remains of the animal. Moreover, in one of several rock fissures associated with the deposit, which has formed a trap for sea birds such as the albatross *(Diomedia melanophris)* and the penguin *(Eudyptula undina)* fresh shells lay on top of partly decayed feathers.

This mound, then, is not a native camp, but is merely the result of the transportation of living or recently dead shell-fish, by storm-waves and wind, from the pools on the rocky ledge at the base of the cliff to their present position on top of the limestone headland. At this place the cliff is not quite vertical and only 6 metres high. Elsewhere the cliff face is somewhat higher, and is undermined by the sea; in consequence no shells have been thrown up.

As mentioned by Howchin, numbers of small quartz flakes were found to be present at low levels in the sandhills at the Brecknells; none of these showed signs of intentional manufacture; in one case it was possible to fit several pieces together and to see that thermal action had caused the flaking. Quartz pebbles were also found on the adjacent beach.

All of the quartz chippings seen by the writers at this beach must be regarded as formed by the natural weathering of quartz pebbles washed up during heavy weather.

DISCUSSION.

Mr. R. G. Thomas first drew our attention to the fact that Murray's Lagoon was once considerably larger than at present, and that much of the area now known as Hawk's Nest was once under water. Climatic or other conditions have caused a shrinking of this body of water to the present dimensions. At some intermediate period, when the lake was larger than at present, native inhabitants made their camps along the shore. The evidence of the distribution of the artefacts suggests that the five-metre shore-line, or thereabouts, was a relatively stable one during one of the last periods of such occupation, and that the Hawk's Nest Peninsula, as it was then, was a favoured camp-site.

Few inferences can be made concerning the people who fashioned the artefacts found on these sites. It is evident that they used very crude cutting, scraping, and hammering implements, and were living on the island sufficiently long ago for traces of organic camp debris to have disappeared.

The primitiveness of the stone implements and the absence of all traces of the dingo *(Canis dingo)* may suggest that the former islanders were, like the Tasmanians, a Pre-Australoid people who have become extinct. On the other

hand, they may have been more recent visitors (related to the present inhabitants of the adjacent mainland), and did not carry their dogs with them to the island.

The mode of entrance is an interesting problem. The straits separating the island from the mainland are at present 13 kilometres in width, with a depth of 37 metres (20 fathoms). Strong currents pass through the channel, and heavy tidal swells are frequent. There is no evidence to suggest that the people of the adjoining mainland ever used any form of marine craft, and certainly none was known at the time of the first Europeans' visits. The Yaralde, Warawalde, and Wanyakalde tribes, at Lake Alexandrina, near the mouth of the River Murray, employed rafts made from large bundles of reeds and rushes, loosely lashed together. The Ngaiyawa and tribes further upstream used canoes made from the thick and heavy bark of the river redgum *(Eucalyptus rostrata)*. These canoes had at most a freeboard of from 5 to 10 centimetres, and were used only on the river and its lagoons. Paddles were unknown, long poles being used for propelling the craft.

The idea that the islanders may have had access to the area when it was still part of the mainland should be considered, although there is no definite evidence at present. The mammals are closely similar to those of the mainland, but in some cases have differentiated sufficiently to have received subspecific recognition; an appreciably long period of isolation is usually considered necessary for such divergences to have taken place. The absence of the dingo (mentioned above) may suggest that the island was separated before the dog was brought to Australia.

Interesting problems arise in considering the possible explanation of the disappearance of the inhabitants of the island. The difficulties that the earliest Europeans met with in obtaining water supplies during dry seasons suggests a possibility that a cycle of drought conditions may have so reduced the fauna and the inhabitants as to lead to the extinction of the group. A similar fate may have been shared by the wombat, which appears also to have become extinct in relatively recent times. The researches of the Animal Nutrition Laboratory on the "coast disease" of sheep, so prevalent on the island, may indicate soil or other deficiencies sufficient, in conjunction with climatic disabilities, to have rendered the environment unsuitable for their continued existence.

If the islanders were derived from mainlanders who possessed marine craft (unlike their more recent descendants or successors), and were in the habit of visiting the island at intervals, it is possible to conceive of accidents sufficiently overwhelming to deter others from making the voyage. It may be that the belief of the Yaralde (Lake Alexandrina) people, that the island is the hunting-place of the dead, arose as a result of some such event.

Kangaroo Island plays several rôles in mainland mythology. According to Teichelmann (6) the Kaurna (Adelaide tribe) name for it is Karta, the meaning of which is "lap" or "female genitalia."

According to Cawthorne (7) it is also called Kukakun. The Ramong name is Kukakungar, the literal translation of which is "females (genitalia of) to," This name may not be very old, as the meaning is reminiscent of the fact that more than one mainland woman was forcibly carried to the island by the sealers.

According to one Yaralde statement the island is the hunting-place of the dead. "Old Betty," one of the two wives belonging to the former "king" of the group at the Murray Mouth, called it Narungawi, and said that Ngurunderi, a mythical being, journeyed down the Murray River and crossed Backstairs Passage. He landed at a place on the island where there is a giant sheoak *(Casuarina)*. He then travelled westward across the island, and threw his spear out into the sea, causing other islands to appear. He then jumped into the sea, dived, and finally reappeared as a star in the heavens.

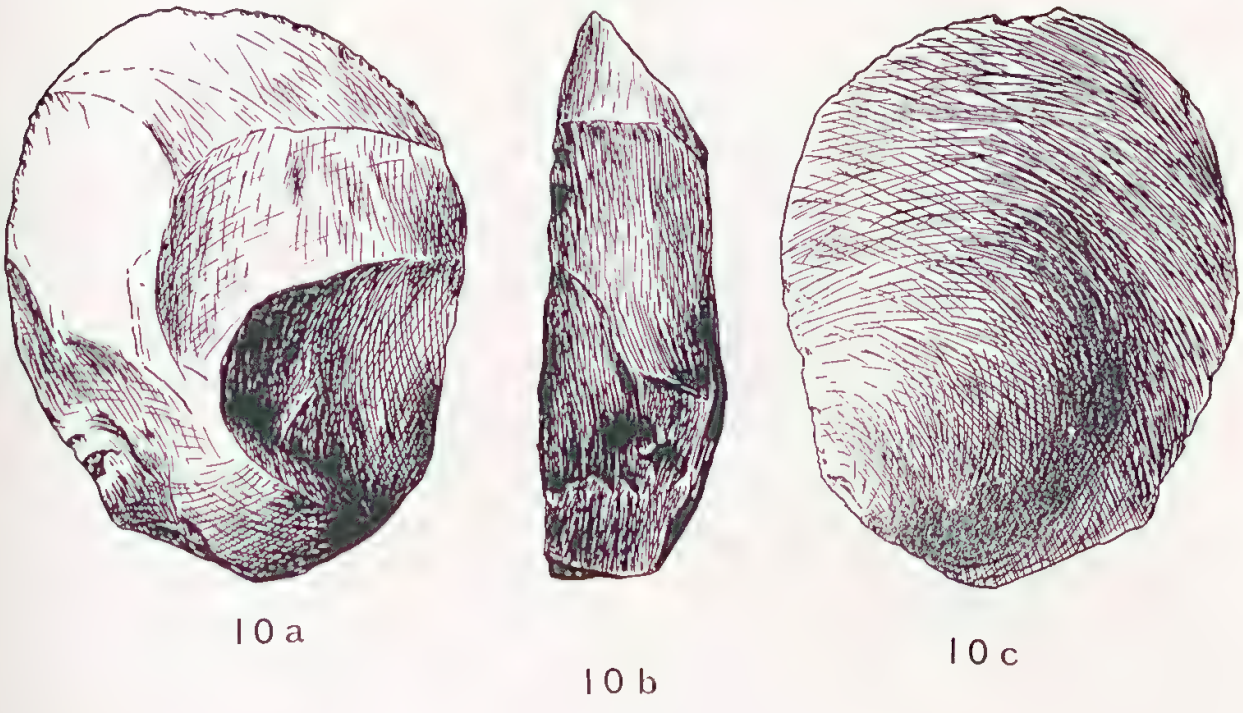
A similar idea is held by the Parnkalla natives, north of Port Lincoln, who, according to Schürmann (8), bury their dead with "the head towards the west, a custom that . . . . is founded on their belief that the soul goes to an island in the east." This island is called Mungaltanna, and is situated somewhere in Spencer Gulf.

Our knowledge of the distribution and sequence of the stone cultures in South Australia is not yet sufficient to enable detailed comparisons to be made between the island and mainland materials; some minor comments are given below.

Hammer-stones. Hammers of some of the types found at Hawk's Nest were used by the Ramong natives at Encounter Bay, who knew them as *mukuruwe*, and employed them in pounding the chewed pellets of rush fibre *(Typha angustifolia)* during the processes of string making. They also served to break animal bones in order to extract the marrow. Among the Parnkalla people of Eyre's Peninsula the *kanyala* was a similar "pebble or round stone, carried about in the knapsack or net, and used in breaking bones, etc."

Trimmed Flakes. It is uncertain in what manner these were employed. In the absence of more specialized implements it seems likely that they were general cutting tools. The *árapia* of the people of the Iliaura tribe, Central Australia, which is a similar implement, functions as a hand-chopper or cleaver, and is used without any handle, in the rough trimming of wood, and in the removal of bark from gum trees. A special use is in the cutting of the soft wood of the bean tree *(Erythrina)* for shields and dishes.

We propose to apply the name *árapia* as a general term for these trimmed



Figs. 10-11. Typical *árapia* or trimmed flake from near Undala Soak, Central Australia, Iliaura tribe (Fig. 10). Quartzite *árapia* from Durham Downs (Fig. 11), 0·6 nat. size.

flakes, and figure (fig. 10), as typical, an Iliaura example which was obtained at Macdonald Downs during the combined Museum and Adelaide University Anthropology Expedition to Central Australia, 1930 (No. A. 14831 in the South Australian Museum).

Trimmed flakes, morphologically the same as the Hawk's Nest examples, are known from several mainland districts. On the adjacent Fleurieu Peninsula

they have been found at Normanville and Inman Valley (by Mr. H. L. Sheard); also from a site 1·5 kilometres west of Port Augusta (N. B. Tindale); from Carrow and Lipson Cove, Eyre Peninsula (Rev. C. Mountford, N. B. Tindale); from the red sandhill region north of the Murray River, near Waikerie; from Dolo, 60 kilometres west of Wilcannia, New South Wales; and from Durham Downs in south-western Queensland (fig. 11).

The Inman Valley examples are from a sand-blow 8 kilometres north-west of Victor Harbour; the Carrow example was found unassociated with camp debris. The Lipson Cove and Port Augusta examples were obtained on extensive camp sites, which proved singularly unproductive of the usual small implements. In general it would appear that the sites from which these implements are obtained have been passed over with scant notice as "poor camp sites," owing to the absence of the specialized microliths, mammal-bones, and other relics of the latest periods of occupation.

Several of these implements were found by Mr. P. D. Riddell on a site near Durham Downs. Associated with the specimens were several fragments of human bone which show traces of mineralization. The matter is inconclusive, but suggests an avenue of future research. The bones preserved in this Museum include portions of two skulls and the fragment of a lower jaw.

Trimmed Cores. The large trimmed discoidal cores are similar to examples found on camp sites at Eden Valley (Section 124, Hundred of Jutland), in the Mount Lofty Ranges. This site is described by Hossfeld (9), who refers to these implements as "chipped blocks of felspar-actinolite gneiss."

The absence of workshop debris at Hawk's Nest on the sites where these objects were found, and the fact that the "cutting edges" are, in some cases, worn as if by use, supports the view that they are definite implements, and not reject cores. This view is already held by some collectors who have obtained them on mainland sites.

SUMMARY.

This paper details evidence of a former native occupation of Kangaroo Island which had ceased before the first visits of Europeans. At Hawk's Nest, the type locality, crude stone implements and many hammer-stones are found on the former shores of a lake or lagoon, now much reduced in area. Apparently a sufficient time has elapsed since the occupation for traces of organic camp debris to have perished. Implements of similar type are known from scattered mainland sites which have proved unproductive of relics of recent occupation.

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BEAKED WHALES—*HYPEROODON PLANIFRONS* AND *MESOPLODON LAYARDII*—FROM SOUTH AUSTRALIA

By HERBERT M. HALE, Curator, South Australian Museum.

Figs. 1-27.

Hyperoodon planifrons Flower.

Hyperoodon planifrons Flower, Proc. Zool. Soc., 1882, p. 392, figs. 1 and 2; Moreno, Anales Mus. de La Plata, Secc. Zool., iii, 1895, pp. 4-8, pl. i, figs. 2 and 3 and pl. ii., figs. 3 and 4.

Early in December 1929, it was reported that a whale was stranded near Port Victoria, on Yorke Peninsula. On request, Mr. A. D. Edwardes, of Port Victoria, furnished a description, which showed clearly that the specimen was a large Bottlenose, with a single pair of teeth at the extreme end of the mandible. The whale had been stranded thirteen miles south of Port Victoria, and was alive when first noticed. It was then upon a sandbank 100 yards or so below high tide mark. During its struggles the animal had excavated a considerable hollow in the sand, and in this depression it died on November 22. None of the numerous visitors heard any sound from the dying creature, that is, no evidence of a voice. The life-colour was described as being bluish-black above with the belly creamy or grey.

In a few days a high tide carried the whale on to seaweed well above the level of the aforementioned spit. On December 10 the writer, in company with the Taxidermist (Mr. J. Rau) and his assistant (Mr. A. Rau), visited the locality in order to secure the skeleton for the Museum. The whale, an adult male, was then lying on its left side, and was partly buried in weed; oil was running freely from the hide. Visitors had removed the tip of the dorsal fin, and also portion of one of the tail-flukes. The body was somewhat inflated, but some flesh-measurements were taken, and a sketch, to scale, was made (fig. 2). It will be noted that the forehead is massive and slopes forward, so that it overhangs the base of the beak. The dental sockets, from which the teeth had been removed by Mr. Edwardes, were entirely fibrous, and showed where the adhering tissue had been cut; they were barely an inch apart, and were situated at the extreme end of the lower jaw. The gums were removed *in toto*, but evidences of no other teeth were apparent. The blow-hole was placed in the mid-line of the head, and slightly in advance of the vertical of the eye, which was 57 mm. in length and

25 mm. in depth. A single pair of throat grooves, each 405 mm. in length, were present; their posterior ends were 280 mm. apart. The penis was extended and prominent.

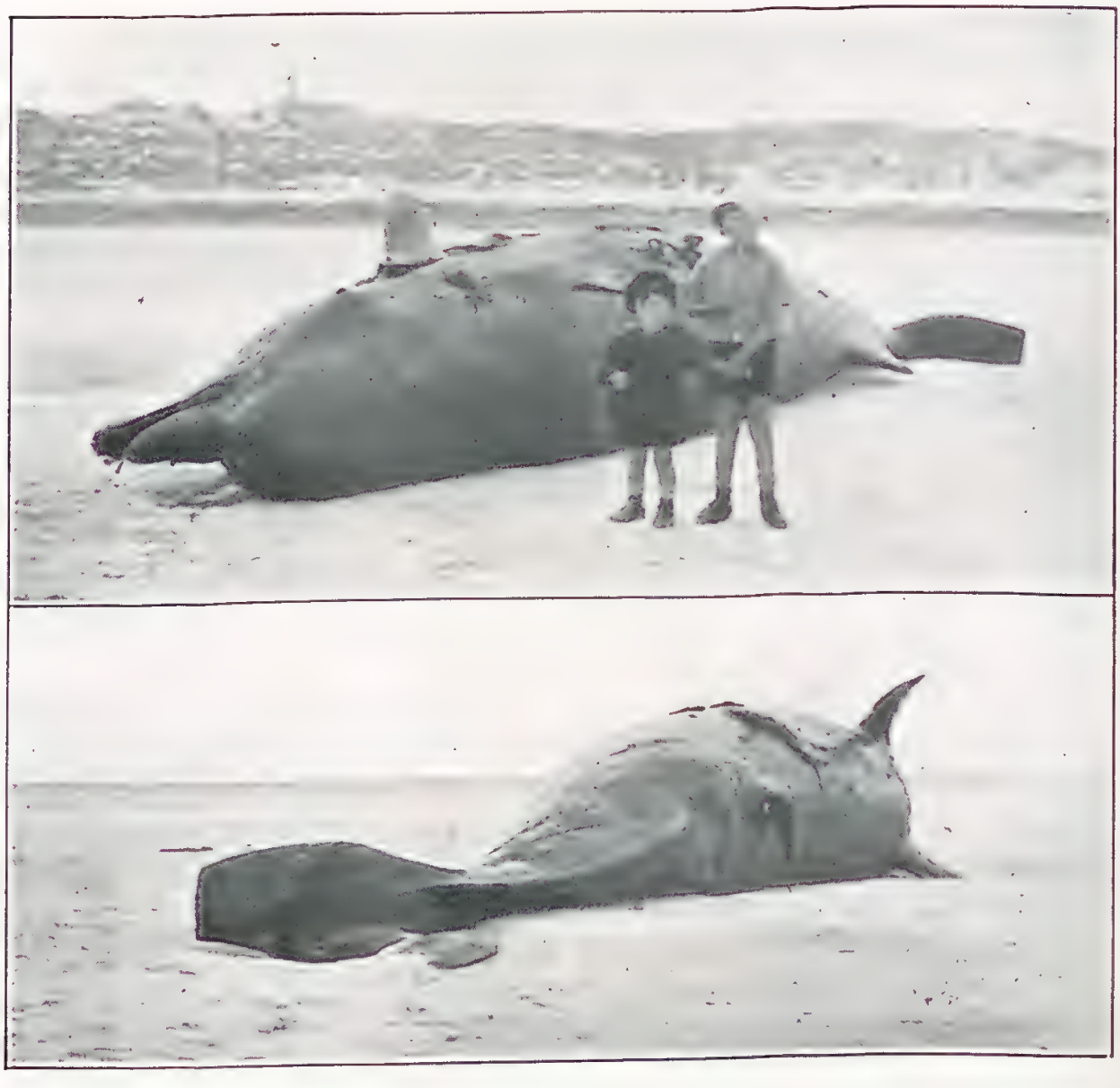


Fig. 1. *Hyperoodon planifrons* on sandbank at Pt. Victoria. (Photos, M. Newbold.)

The stomach contained a large quantity of Cephalopod beaks, regarding which Mr. B. C. Cotton (Assistant Conchologist at this Museum), reports: "The large size of these beaks indicates that they are from Cephalopoda of considerable bulk. Our common *Sepia apama* has the beak smaller and of different shape. The only other member of our known Cephalopod fauna which could have beaks of this size is *Polypus variolatus*, of which we have a specimen 1,180 mm. in length."

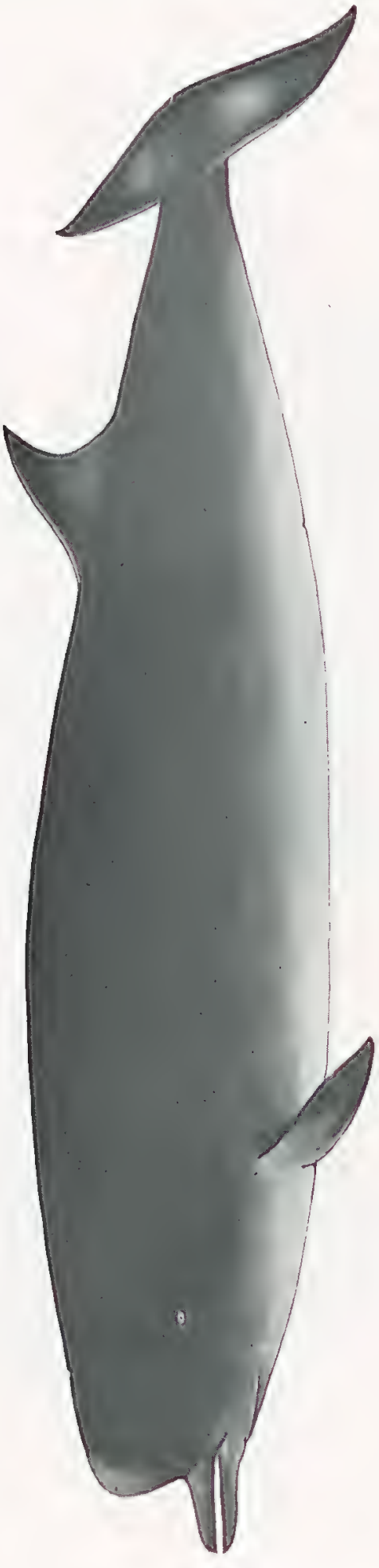


Fig. 2. *Hyperoodon planifrons*, Pt. Victoria.

Local fishermen stated that a school of about twenty-five whales was observed in Spencer Gulf immediately prior to the casting up of this specimen, and that they considered it to be one of this school. The Blackfish *(Globiocephala melaena)* has been seen in herds in both Spencer and St. Vincent Gulfs, but as *Hyperoodon ampullatus* is said to be gregarious the evidence is given for what it may be worth.

The writer is extremely indebted to Mr. A. D. Edwardes for help in obtaining a satisfactory preliminary description of this whale; also to Mr. H. E. A. Edwardes, who rendered considerable assistance with transport. Mr. J. Rau and his assistant (Mr. A. Rau) spared no pains in order to ensure that the complete skeleton might be secured, and are to be congratulated upon the enthusiastic manner in which they undertook an unpleasant task, the whale having been dead for nineteen days when the "fleshing" was commenced. Mr. B. Cotton is responsible for the photographs of the skeleton, and Mr. H. Condon assisted in the preparation of the drawing reproduced in fig. 2.

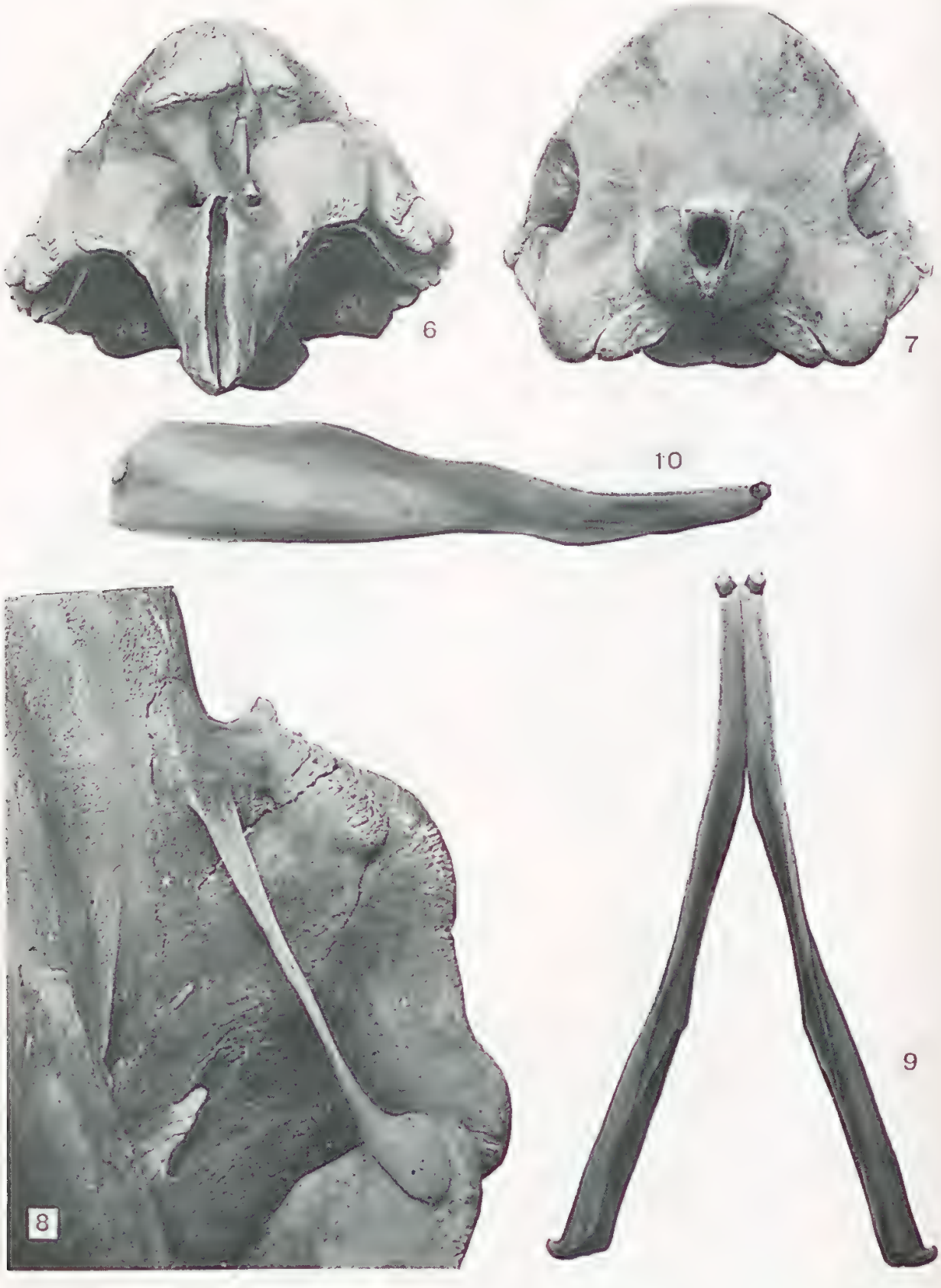
External Dimensions.

	mm.	ft.	in.
Total length to middle of tail-flukes	6935	22	9
Tip of beak to eye	1067	3	6
Tip of beak to vent	4800	15	9
Tip of beak to penis	4192	13	9
Tip of beak to origin of dorsal fin	4673	15	4
Tip of beak to axilla	1830	6	0
Length of gape	458	1	6
Length of pectoral fin	813	2	8
Breadth of flukes (approx.)	2035	6	8

Skull.

Sutures, particularly on dorsum, more or less anchylosed. Apex of rostrum acute, deeper than wide opposite distal ends of maxillae. Premaxillae not widely separated, strongly over-arching mesorostral gutter excepting at extreme distal end; with sharp edges, parallel above groove to level of premaxillary foramina, where the right premaxilla twists to the left; expanded distal parts smooth anteriorly and rugose dorsally; the right is particularly massive, with the anterior face nearly twice as wide as that of the left. Groove between nasals deep but narrow; inner anterior edge of each nasal (at bottom of groove) drawn up into a low, thin flange. The vomer appears in floor of mesorostral groove 380 mm. from tip of rostrum, and passing back soon occupies whole concave floor of the groove and the greater part of its sides; no median elevation and no mesirostral ossification; an elongated section of the vomer is visible on the inferior surface of the beak, 375 mm. from the tip, and a tiny section appears between the palatines and

Figs. 3-5. Dorsal, ventral, and lateral views of skull of *Hyperoodon planifrons*.



Figs. 6-10. *Hyperoodon planifrons:* 6-7, anterior and posterior views of skull; 8, orbital region; 9-10, mandible.

pterygoids. Mesethmoid extending forward nearly to level of antorbital notches, where it fills the mesorostral groove and is nearly covered by the premaxillae; at about level of maxillary foramina the mesethmoid exhibits a crest, sharply bent to the left, and lying against the left premaxilla; this crest is thickened at the anterior border of the nares, then is continued as the sharp-edged nasal septum, sweeping, with strongly convex margin, ventrally, then dorsally with slightly concave margin. The mesethmoid generously overlaps the nasals, but the septum does not nearly meet the low internasal crests. Maxillary foramina a little in advance of premaxillary foramina. Maxillary tuberosities much wider than deep, rounded, and slightly inverted in region of maxillary foramina, which they partly overhang; right tuberosity with a low, dorsal, longitudinal carina, which sweeps forwards and downwards, but vanishes at about the level of the antorbital notch; left with a similar but obsolete carina. Outer border of orbit concave in dorsal or ventral view. Antorbital tubercle large, and antorbital notch deep. Antorbital tubercle and ventro-lateral faces of malar and lachrymal rough and irregular (fig. 8).

Mandible and Teeth.

The rami of the mandible are anchylosed together at the symphysis; the groove between, dorsally and ventrally, is crossed by ossified bridges, suggesting that fusion was still proceeding (figs. 9-10).

Fig. 11. Teeth of *Hyperoodon planifrons* (a, left; b, right); nat. size.

The teeth were sent to the Museum before the writer examined the whale. Mr. Edwardes wrote that they were "at the extreme end of the mandible, sloping forwards, and about one inch apart. They were rather mobile, and I had little

difficulty in extracting them with a penknife." They are subconical in shape, with the roots entirely closed (fig. 11). Including the apical denticle, they projected only about 20 mm. above the gum. Their dimensions are:

	Left.	Right.
Length	57 mm.	59 mm.
Greatest diameter	36 mm.	37 mm.

Dimensions of Skull.

	mm.
Total length	1391
Height from vertex to inferior border of pterygoids	666
Tip of rostrum to level of antorbital notches	857
Tip of rostrum to posterior free border of pterygoids	1141–1150
Tip of rostrum to anterior end of nasals	1065
Breadth of rostrum at antorbital notches	500
Breadth of rostrum in front of maxillary tuberosities	210
Greatest depth of rostrum	227
Breadth of premaxillae in front of nares	295
Breadth of base of maxillary tuberosity (at antorbital notch)	200–204
Depth of maxilla (antorbital tubercle to dorsal margin)	175
Height of supraoccipital (dorsal edge of foramen magnum to top of occipital crest)	410
Dorsal narrowest width of supraoccipital, between hinder margins of temporal fossae	85
Width of foramen magnum	60
Width of condyles	237
Height of condyles	174
Length of tympanic bulla	52
Breadth of tympanic bulla	42
Length of mandible	1184
Length of symphysis	392
Depth of mandible at coronoid	218

Vertebrae, Ribs, etc.

The number of vertebrae is: Cervical, 7; thoracic, 9; lumbar, 10; caudal, 20 = total 46. All seven cervicals are fused together. The neural spines from the second thoracic to the seventh caudal lean back well beyond the level of the posterior margins of their respective centra. The spines of the second to ninth thoracics have been damaged during life, and the fifth to ninth in particular

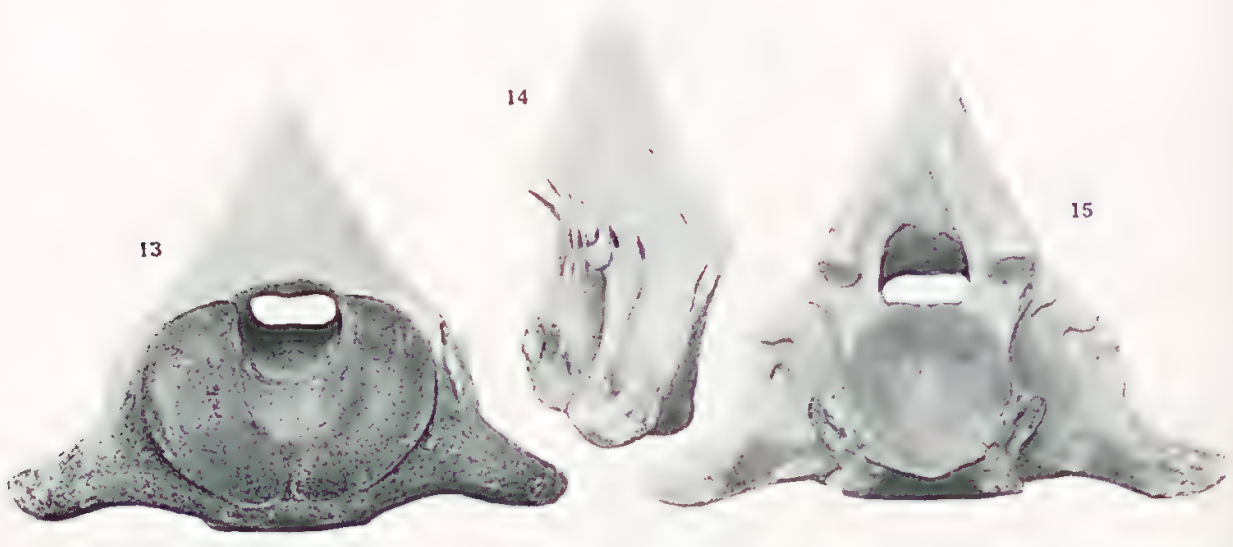
Fig. 12. Skeleton of *Hyperoodon: planifrons*.

exhibit considerable callosity where the bone has been broken across. All of the lumbars have been similarly broken, the eighth to tenth immediately above the neural arch. The tip of the spine of the fifth caudal has been damaged, apparently by a heavy blow from above.

There are nine ribs, seven of which are double-headed. The sternum is of three pieces. The articular facet for the eighth rib is at the end of two fused processes from centrum of eighth thoracic.

Cervical Vertebrae.

All anchylosed, the conjoined neural arches and spines sloping backwards and forming a pyramidal mass (figs. 13-15). Foramina above anterior articular facets of atlas complete; edges of facets raised; inferior lateral processes strong, bent slightly downwards and backwards, and fused with similar process of second



Figs. 13-15. Anterior, lateral, and posterior views of cervical vertebrae of *Hyperoodon planifrons*.

cervical, there being a complete foramen between on each side. Second cervical with a short, rugose, superior lateral process; an incomplete foramen on right and complete foramen on left, between it and inferior lateral process. Third with a short superior lateral process, that on left anchylosed with process of preceding cervical (leaving a complete foramen), that on right side free. Fourth to sixth cervicals with rudimentary superior lateral processes. Seventh with greater part of right side of neural arch free, including apex, which does not meet the opposite member of the arch; lateral process practically non-existent; a thick articular facet for head of first rib has its upper margin at middle of side of centrum.

Thoracic Vertebrae.

First: Neural spine nearly vertical, pointed, shorter than centrum and arch together. Process with facet for tubercle of first rib on side of neural arch, directed downwards and forwards. Facet for second rib on middle of side of centrum, near posterior edge.

Seventh: Metapophyses short and stout, widely separated, and with a broad, rugose articular process and facet (for tuberculum of seventh rib) projecting outwards and downwards. No facet on centrum and lateral process represented by a low boss on each side. Neural spine of approximately equal width throughout (widest at middle of length owing to injury), truncate at tip, and higher than any of preceding spines.

Eighth: Metapophyses rather thin, subtriangular. Articular process for rib directed outward and slightly backward, fusing with a transverse process from side of centrum, leaving a large foramen between on each side; articular facet large, elliptical, and rugose.

Ninth: Metapophyses subtriangular, with upper margin almost straight. Transverse process wide, a little longer than centrum, narrowed at base, but with the proximal anterior corner produced forwards; anterior edge sinuous, posterior oblique; articular facet not distingishable, the "tubercle" area of the eighth rib articulated along oblique distal margin, and ninth rib articulated at posterolateral corner. Neural spine three and one-half times as long as wide.

Lumbar Vertebrae.

The neural spines are subequal in length, each a little longer than in last thoracic; they are widest near the tip (those of the eighth and ninth are equally as wide at base owing to healed fractures). The metapophyses in all are similar to those of last thoracic. Each centra presents an inferior median ridge, longitudinally convex in the first to seventh lumbars and longitudinally concave and less marked in the eighth to tenth.

First: Similar to last thoracic, but with transverse process directed rather more forward and with proximal anterior angle less produced.

Tenth (last lumbar): Centrum as long as that of first caudal and longer than that of any preceding vertebra. Neural arch and spine together two and one-fourth times length of centrum; apex of spine more truncate than in other lumbars. Transverse process one-half as long as centrum, curving forward so that anterior distal angle is almost in line with anterior face of centrum. Metapophyses closer to each other than in preceding vertebrae.

Caudal Vertebrae.

First (27th vertebra): Similar to last lumbar, but neural spine with apex more truncate and with anterior and posterior margins straighter and therefore more nearly parallel. Metapophyses and transverse processes similar. Centrum slightly flattened inferiorly, with merest indications posteriorly of facets for chevrons.

Second: Similar to first, but with transverse process only two-thirds as long. Centrum slightly longitudinally concave inferiorly, with a pair of slight facets anteriorly and two small but distinct processes with facets posteriorly.

Third: Similar to second, but both posterior and anterior inferior processes for chevrons are larger, although the front ones are still small. On each side of centrum a low oblique ridge runs up and back from junction of anterior margin of transverse process.

Fourth to sixth: The centra on each side have a slightly oblique ridge, immediately below the neural arch.

Seventh: Depth of centrum (exclusive of inferior processes) greater than length and equal to length of neural arch and spine together. Metapophyses scarcely projecting anteriorly; a strong rugose ridge running backwards from their origin on each side across two-thirds of base of spine. A less pronounced longitudinal ridge on each side at base of neural arch. Transverse process represented by a strong ridge, highest anteriorly, perforated by a complete foramen on left side and an incomplete on right. Chevron processes large. Median inferior surface of centrum slightly concave.

Eighth: Similar to seventh, but neural spines shorter, and transverse process represented by slight lateral thickening anteriorly. Anterior and posterior chevron processes almost meeting on each side, thus enclosing a deep inferior groove.

Ninth: Chevron processes represented by two inferior ridges, each perforated in middle of length, and with articular facets fore and aft.

Eleventh: Centrum much deeper than long, grooved below, and with a pair of inferior foramina. Neural arch and spine represented by a low boss, on each side of which are indefinite rounded projections (metapophyses). A dorsal foramen on each side of centrum.

Twelfth to fifteenth: Grooved inferiorly, and with one or two inferior foramina and a pair of dorsal foramina. Thirteenth to fifteenth subquadrangular in shape. Low humps and ridges indicate obsolete neural arches and lateral processes.

Eighteenth to twentieth: Rugose, subconical; foramina obliterated.

Chevrons.

Ten in number, the members of each pair united; fig. 16 shows the respective shapes and sizes. Number four is 230 mm. in depth, and its greatest length is 152 mm.

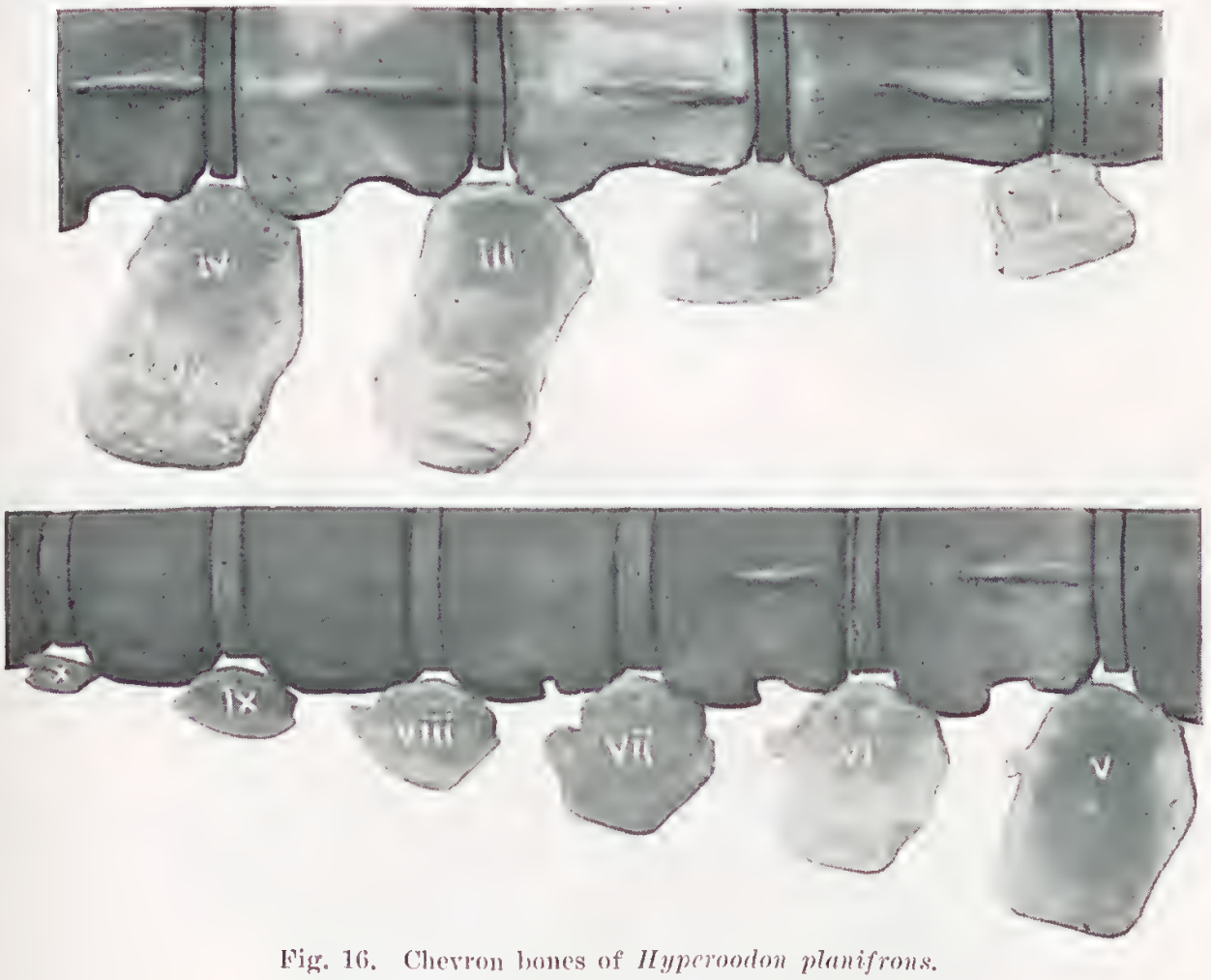


Fig. 16. Chevron bones of *Hyperoodon planifrons*.

Ribs.

First rib much shorter than any of the others, excepting the ninth, and much wider, the breadth being almost one-third the length; broadest at proximal end; head and tubercle wide, situated close together. Succeeding ribs decrease in breadth and increase in length to the sixth. Seventh about same breadth as sixth, but a little shorter. Eighth about 30 cm. shorter. Ninth ribs much more slender than any of the preceding; asymmetrical, the left little more than half as long as the right, which is longer than the first rib.

The capitulum and tuberculum of the first rib are separated by a gap of 20 mm.; in the third, fourth, and fifth ribs this distance becomes successively greater, but in the sixth is slightly reduced. The tubercle of the seventh rib is only moderately developed, and the eighth and ninth have no tubercle, although

the eighth is rugose on the area by which it is articulated to the oblique margin of the transverse process of the ninth thoracic. The head of the eighth bears a large facet, but the ninth has no definite facet.

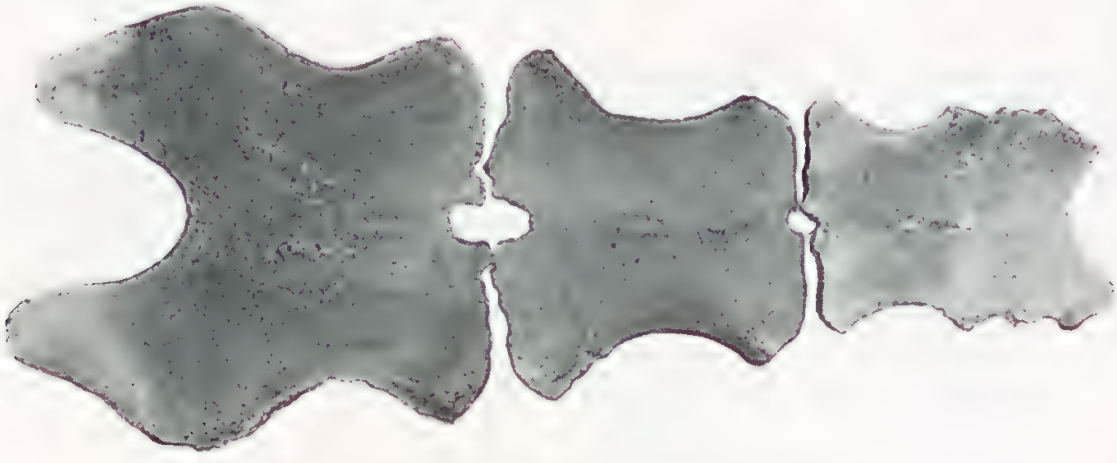


Fig. 17. Sternum of *Hyperoodon planifrons*.

Sternum.

Three pieces. Manubrium (including in length anterior projections) a little longer than wide, rugose and convex inferiorly, smoother and concave on inner face. A deep anterior notch and a relatively very small posterior notch. Lateral edges concave. Facets for cartilaginous sternal ribs thick and prominent.

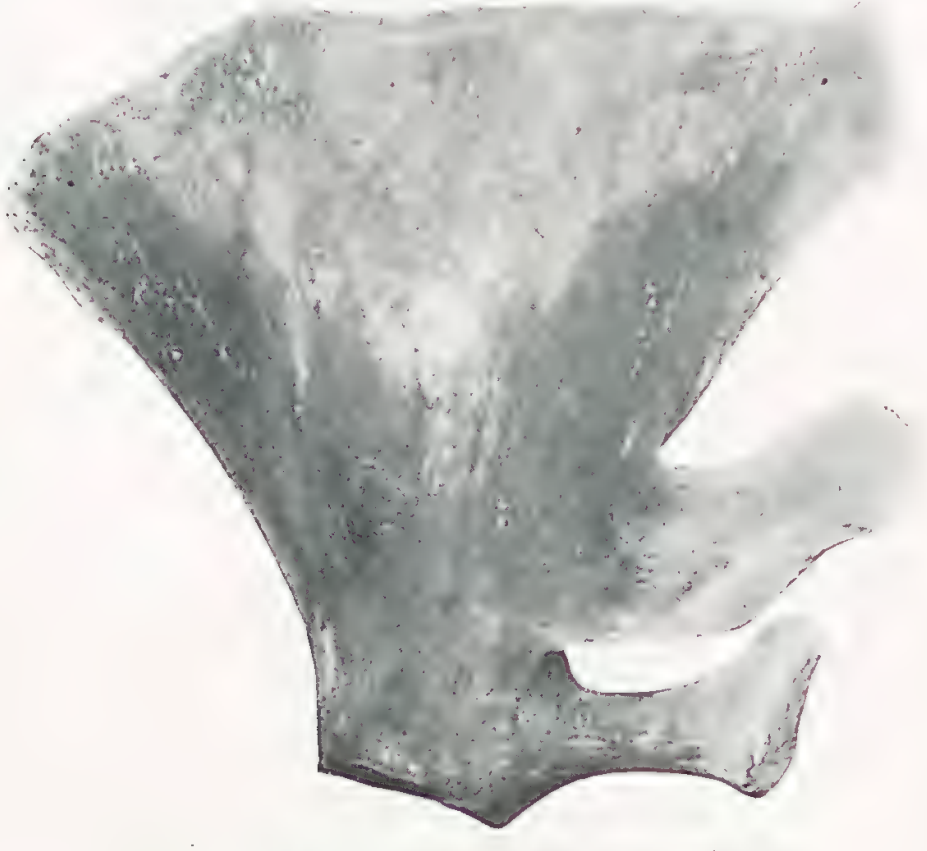


Fig. 18. Right scapula of *Hyperoodon planifrons*.

Second segment widest anteriorly, where the breadth slightly exceeds the length. Anterior notch equal in size to posterior notch of manubrium; posterior notch much smaller. A longitudinal median, rugose, inferior ridge.

Third segment bears facets for cartilage of fourth and fifth ribs and in part (antero-lateral angles) for third ribs. Anterior margin with very small notch; posterior notch wide and shallow.

Scapula.

Ridges distinct. Anterior margin nearly straight, posterior border slightly concave and superior irregular. Anterior angle broadly rounded, posterior angle more acutely rounded. Acromion bent upwards and inwards, narrower across rounded tip than at base, constricted at distal third, so that superior border is concave and inferior sinuous. Coracoid shorter than acromion, considerably expanded, and rugose at tip.

Fore-limb.

Left flipper slightly damaged by post-mortem abrasion.

Head of humerus oblique, overhanging shaft on ulna side; distal end not expanded; deltoid ridge irregular and rugose. Radius slightly widened at distal end, almost straight. Ulna slender, half as broad as radius, suboval in section;

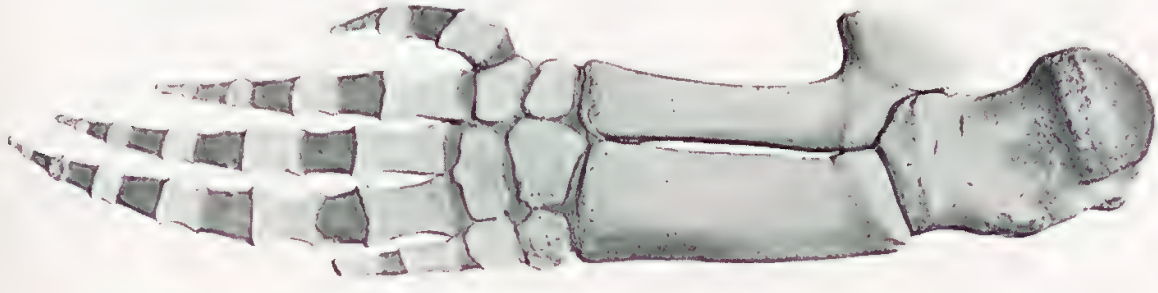


Fig. 19. External surface of bones of right fore limb of *Hyperoodon planifrons*.

olecranon prominent, thin, and pointed. Six carpals, two on ulna side in line with metacarpal iv, two in middle and two on radial side in line with metacarpal i. Phalanges (including metacarpals):

Right: i, 2; ii, 7; iii, 6; iv, 5; v, 3.
Left (incomplete): i, 2; ii, 5; iii, 4; iv, 4; v, 3.

The terminal phalanges of ii to v are minute.

Pelvic Bones.

Slender, simple, each approximately 110 mm. in length. They were situated 4,500 mm. posterior to the tip of the mandible, below the last lumbar.

Loc. Thirteen miles south of Port Victoria, western coast of Yorke Peninsula, South Australia. (Complete skeleton in South Australian Museum, Reg. No., M. 2852.)

MESOPLODON LAYARDII Gray.

Ziphius layardii Gray, Proc. Zool. Soc., 1865, p. 358.

Mesoplodon layardii Oliver, Proc. Zool. Soc., 1922, p. 574 (syn. and ref.); Waite, Rec. S. Aust. Mus., ii, 1922, p. 209, pl. ii and iii; Scott and Lord, Proc. Roy. Soc., Tasmania (1926), 1927, p. 87.

In 1922 Waite *(ut supra)* recorded this species from South Australia, a single young male (the skeleton of which was secured for the Museum), having been stranded at Kingston. Three further examples have since been cast up on our shores, one at Port Victoria and two near Victor Harbour.

PORT VICTORIA SPECIMEN.

A few days after the skeleton of *Hyperoodon planifrons,* described above, had been secured, Mr. A. D. Edwardes wrote that another, but different, Beaked Whale had been stranded close to the same spot—a remarkable coincidence. It was much decomposed, and was reduced to "about 12 feet in length." It proved to be a Strap-toothed Whale, with the teeth unerupted, and Mr. Edwardes kindly secured and cleaned the skull for the Museum. The sex was not noted.

Skull.

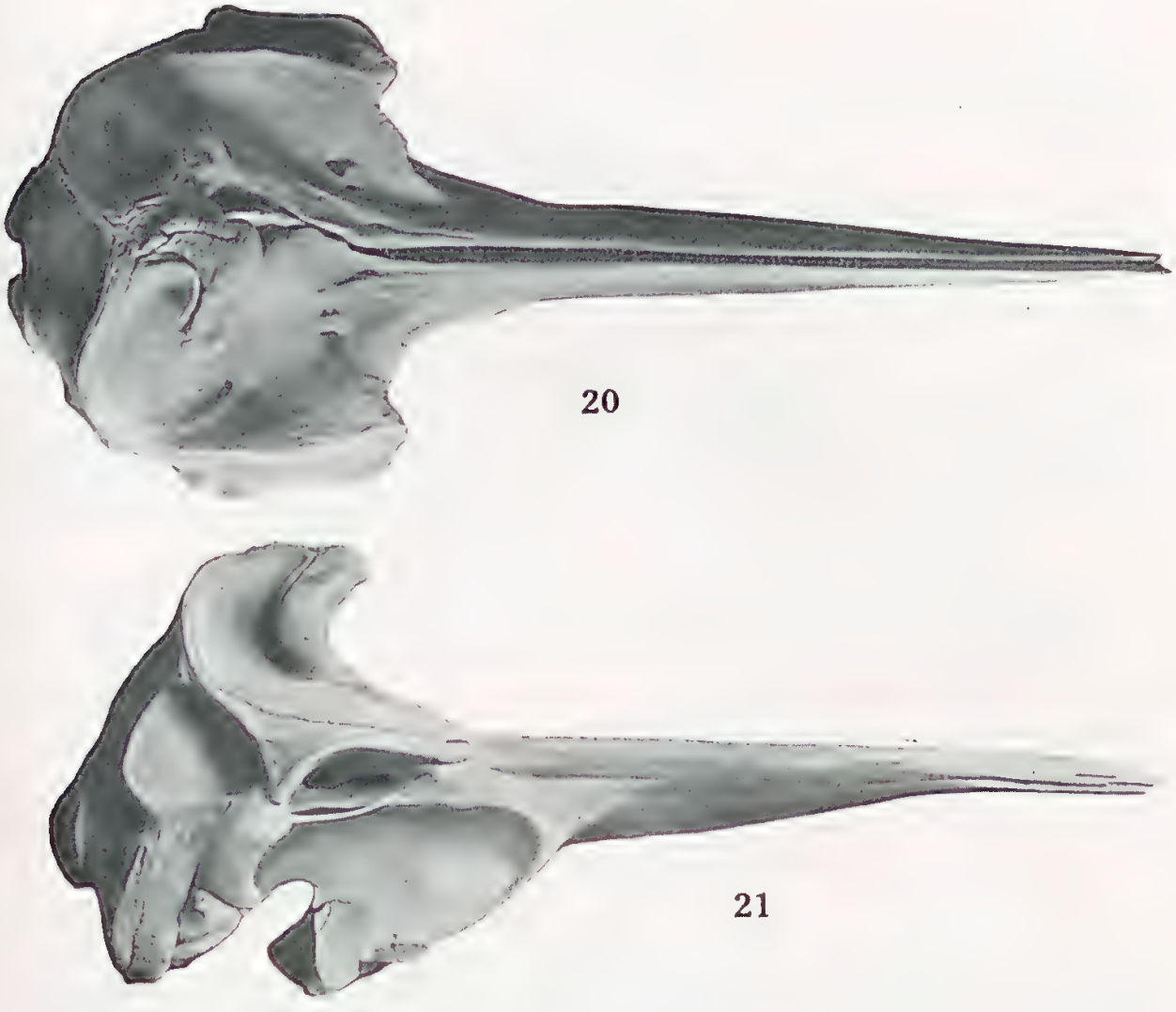
Very similar to that of the Kingston example described by Waite. The vomer appears in the mesorostral groove 160 mm. from tip of rostrum, and is evident ventrally at this point also, the inferior visible portion fusiform, 180 mm. in length; a tiny section appears also between the palatines and pterygoids. The premaxillary foramina are almost in line, and are in advance of the maxillary foramina.

Mandible with rami separate. Teeth with denticle projecting outwards but not downwards or upwards (fig. 24). Dimensions of teeth:

	Right.	Left.
Length of base - - -	73 mm.	72 mm.
Greatest depth - - -	30	30
Greatest width - - -	8·5	8

The dimensions of this skull and of that of one of the Victor Harbour specimens are given below.

Loc. Thirteen miles south of Port Victoria, western coast of Yorke Peninsula, South Australia. (Skull in South Australian Museum, Reg. No. M. 2853.)



Figs. 20-21. *Mesoplodon layardii:* dorsal and lateral views of skull of example from Pt. Victoria.

VICTOR HARBOUR SPECIMENS.

On or about February 3, 1931, two small whales, which were previously noted sporting inshore, were cast up between Victor Harbour and Port Elliot, in Encounter Bay (figs. 22-23). These were examined by Mrs. L. C. Simpson, who measured the total length of each and made sketches. One example, a male, was 15 feet in length; the other, more bulky, a female, 17 feet in length. Mrs. Simpson stated that she could find no teeth in either, the gums being "quite smooth." The colour of both was black above and white below.

On receiving this report we visited the locality (February 6), and found that the female had been carried out by a high tide and washed in again nearer to Port Elliot. The beak and mandible were missing, and the cranium was badly smashed.

The male had been thrown up near the township of Victor Harbour, and had

Fig. 22. Ventral view of *Mesoplodon layardii* (male, 15 ft. in length) on beach at Victor Harbour (Photo, A. S. Sladden).

been cut up and buried by council employees. The head was disinterred, and the Museum Taxidermists secured the skull.

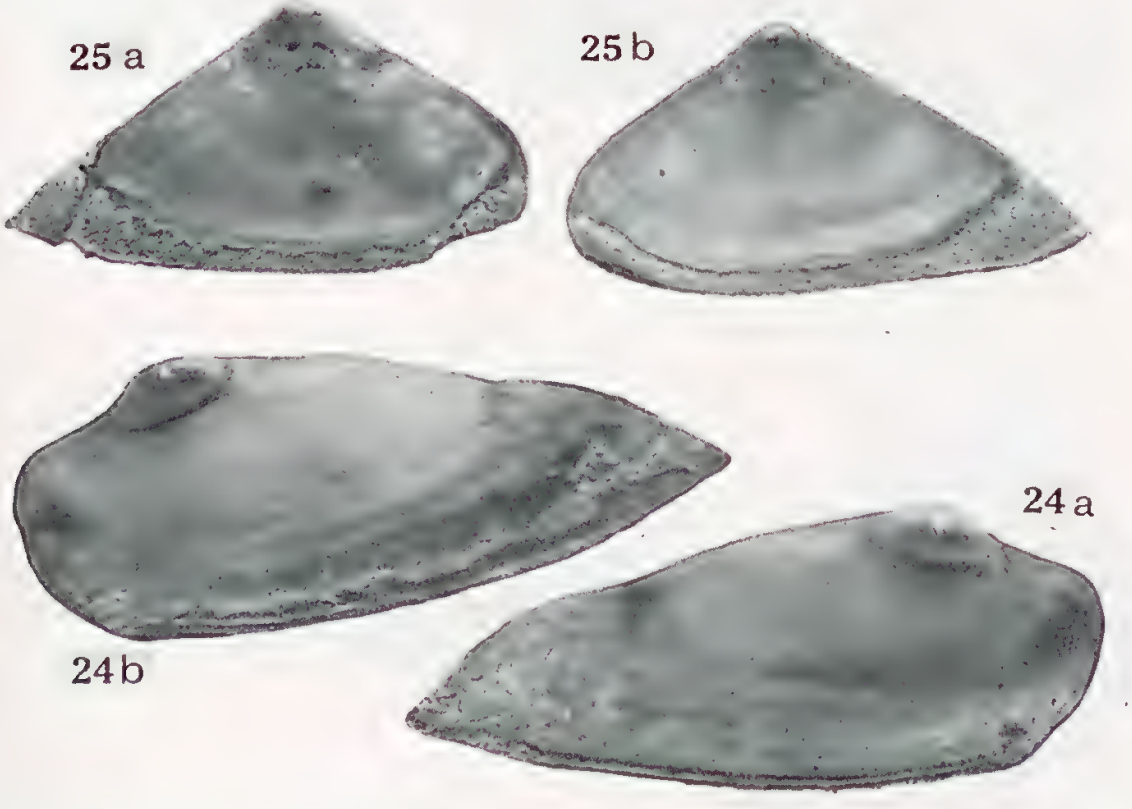
The ventral view of the male (fig. 22), taken soon after stranding, shows the creature partially buried in sand by the receding tide, but the single pair of throat grooves is apparent.

Fig. 23. Dorso-lateral view of *Mesoplodon layardii* (female, 17 ft. in length), on beach near Pt. Elliot (Photo, A. S. Sladden).

Skull of Male.

Younger than the preceding. A little less of the mesethmoid is ossified and the temporal fossa is wider. The right premaxilla, in front of the nares, is not twisted to the left quite so much. The beak is shorter but distinctly wider, and

the area of the external faces of the palatines is greater (*cf.* figs. 21 and 27). The mesorostral gutter (as in other immature examples) is empty when the cartilage is removed by maceration; the vomer appears in the groove, and also inferiorly, 140 mm. from the tip of the beak; ventral visible part 200 mm. in length; a small portion appears between palatines and pterygoids also. The premaxillary foramina are in line and are on a level with the maxillary foramina. Each pterygoid exhibits three areas, near the inferior margin, occupied by very thin cellular bone, evidently sites of former foramina. Basi, thyro, and stylohyals not fused.



Figs. 24-25. Teeth of *Mesoplodon layardii* (a, left; b, right); 24, of example from Pt. Victoria; 25, of male from Victor Harbour (nat. size).

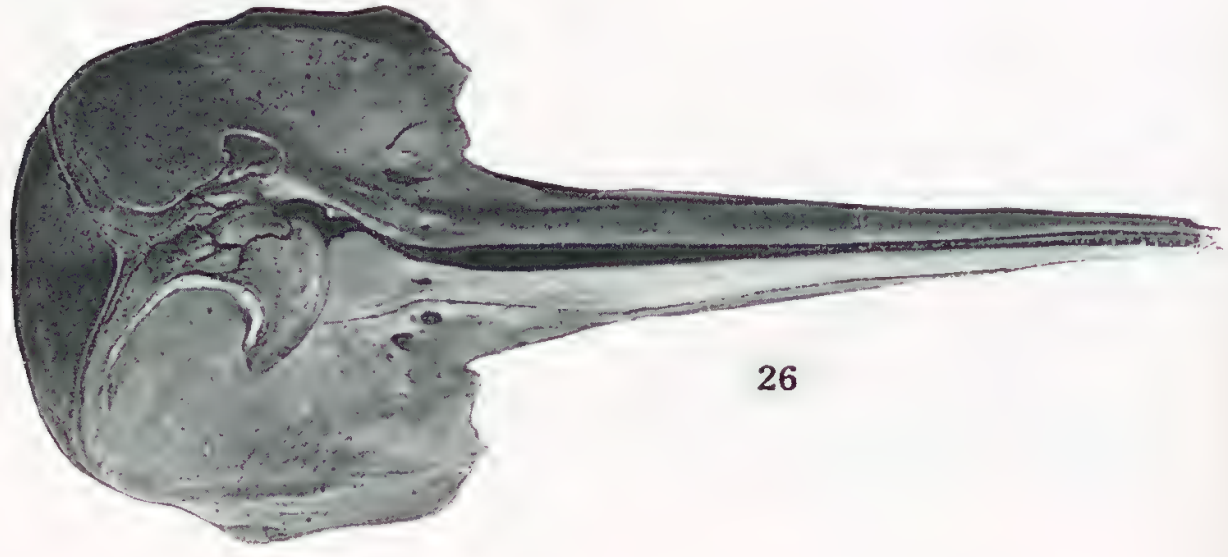
Mandible with rami separate. Teeth with denticle pointing outwards and upwards (fig. 25). Dimensions of teeth:

	Right.	Left.
Length of base - - -	52 mm.	54 mm.
Greatest depth - - -	29	29
Greatest width - - -	9	9·5

The teeth of Waite's male from Kingston (15 feet 3 inches in length) are similar to those of the example from Port Victoria, but in the latter specimen the denticle is down-bent. In this younger Victor Harbour male the teeth

resemble closely those of a specimen 14 feet in length, described and figured by Turner (1).

Loc. Victor Harbour, South Australia. (Skull in South Australian Museum, Reg. No. M. 2969.)



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Figs. 26-27. *Mesoplodon layardii:* dorsal and lateral views of skull of male from Victor Harbour.

Dimensions of Skulls of Mesoplodon layardii.

	Pt. Victoria. Sex ?.	Victor Harbor. Male.
Total length - - - - - - - - - -	910 mm.	800 mm.
Height from vertex to inferior border of pterygoids -	332	331
Tip of rostrum to level of antorbital notches - -	575	500
Tip of rostrum to posterior border of pterygoids - -	730	640

(1) Turner, "Challenger" Report, i, 1880, p. 10, pl. ii, figs. 15-16.

	Pt. Victoria. Sex ?.	Victor Harbour. Male.
Greatest depth of rostrum	81	70
Breadth between orbits	356	343
Breadth between antorbital "tubercles"	256	241
Breadth of premaxillae in front of nares	153	148
Greatest breadth of anterior nares	50	55
Length of tympanic bulla	43–44	43–45
Breadth of tympanic bulla	33	30
Height of supraoccipital (dorsal edge of foramen magnum to top of occipital crest)	200	220
Width of foramen magnum	58	52
Width of condyles	135	132
Height of condyles	77	74
Length of mandible	738	681
Greatest depth of mandible	116	116
Length of symphysis	200	182

Descriptions of persons who saw the two whales cavorting near the rocky coast of Victor Harbour suggest that the animals were mating, and in their excitement became fouled by rocks, both examples exhibiting extensive cuts.

Sexual activities may account for some otherwise unaccountable strandings. In September, 1903, five Blackfish *(Globiocephala melaena)* were stranded at St. Kilda, in St. Vincent Gulf, about twenty miles north of Adelaide, under the following circumstances. Mr. Temby, a fisherman, "was scared by the groaning of some animal in the mangrove swamp." The creature proved to be a female Blackfish in difficulties in the mud of the swamp. Mr. Temby then noticed four other individuals swimming in shallow water nearby, and apparently loth to leave the female. When the tide fell these four, all males, were also left high and dry. The skeletons of three of the males and of the female are in the South Australian Museum.

The GOOSE-BEAKED WHALE *(ZIPHIUS CAVIROSTRIS)* in NEW IRELAND

By HERBERT M. HALE, Curator, South Australian Museum.

Figs. 1-2.

Ziphius cavirostris Cuvier.

Ziphius cavirostris Cuvier, Ossem. Foss., v, 1823, p. 350; Longman, Proc. Roy. Soc., Qld., xxxi, 1919, p. 90, pl. iii and iv (near Maryborough, S. Qld.); Oliver, Proc. Zool. Soc., 1922, p. 576 (syn. and ref.); Dammerman, Treubia, viii, 1926, p. 336, pl. iii (north coast of Java); Vinciguerra, Ann. Mus. civ. St. Nat., Genova, lii, 1927, p. 232 (Ligurian Sea); Scott and Lord, Proc. Roy. Soc., Tasmania, 1928, p. 156 (Preservation Island, Tasmania).

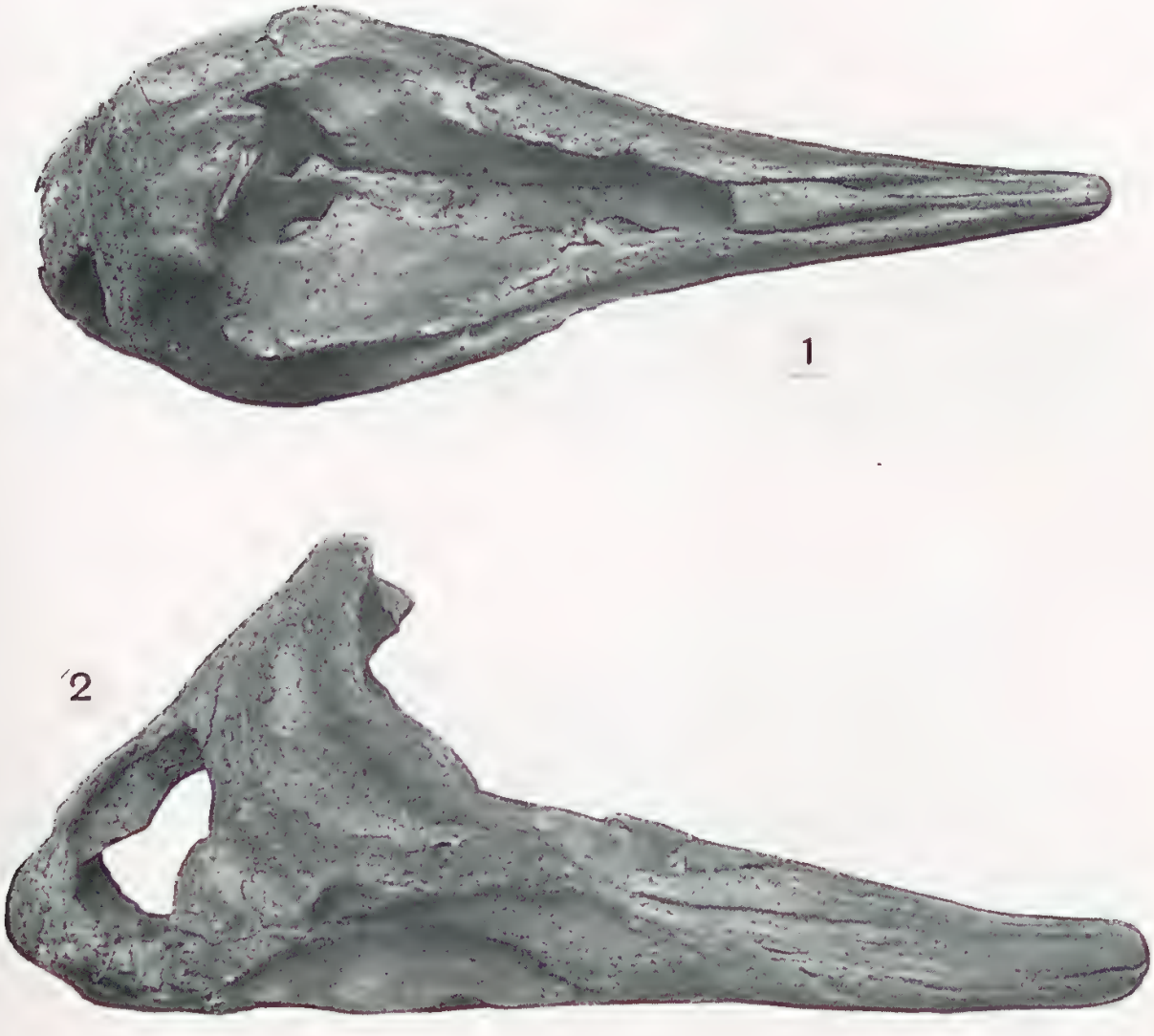
A much damaged and abraded skull was presented to the Museum by Mr. P. Vanderghinste in November, 1921; it arrived in fragments, but has been reassembled. Although it is small, the superior sutures are anchylosed, the mesirostral ossification is well developed, and the prenarial basin is deep; the skull is therefore evidently that of an adult male.

The rostrum has the bone of the distal half extremely dense and is blunt apically. Mesirostral ossification slightly higher than premaxillae near tip of rostrum; posterior to this it forms a narrow ridge, with a deep groove between it and each premaxilla, then widens to almost completely fill the mesorostral groove, and terminates at hinder third of length of beak, with a deep, oblique, concave posterior face. Anterior faces of expanded proximal portions of premaxillae deeply concave. Orifice of anterior nares far below level of nasal boss.

Dimensions of Skull.

Total length - - - - - - -	797 mm.
Tip of rostrum to anterior end of nasals -	574
Greatest depth of rostrum - - - -	140
Breadth of premaxillae in front of nares -	225

Loc. Kopo, New Ireland. (Incomplete skull in South Australian Museum, Reg. No. M. 848.)



Figs. 1-2. *Ziphius cavirostris:* dorsal and lateral views of skull from New Ireland.

The PIGMY RIGHT WHALE *(NEOBALAENA MARGINATA)* in SOUTH AUSTRALIAN WATERS

By HERBERT M. HALE, Curator, South Australian Museum.

Figs. 1-4.

Neobalaena marginata (Gray).

Balaena marginata Gray, Zool. "Erebus and Terror," 1846, p. 48, pl. i.
Neobalaena marginata Gray, Ann. Mag. Nat. Hist., (4) vi, 1870, p. 156; A. Zietz, Trans. Roy. Soc., S. Aust., xiii, 1890, p. 8; Ogilby, Cat. Aust. Mammals (Aust. Mus. Cat., No. xvi), 1892, p. 67; Lord and Scott, Vert. Animals of Tasmania, 1924, p. 295; Oliver, Proc. Zool. Soc., 1922, p. 559 (refs.); F. Wood Jones, Mammals of South Australia (Brit. Sci. Guild Handbook), part iii, 1925, p. 275.

In 1890 A. Zietz *(ut supra)* recorded the fact that three examples of this species had been secured on South Australian coasts, and that two of them had "been photographed and exact measurements taken from the fresh animals." He stated that two of the specimens came from Kangaroo Island, and one (an immature example) from Encounter Bay, but no other details were given.

A search through old receipts, diaries, annual reports, photographs, and MS. records has brought to light the data herein recorded.

All three examples were taken within a radius of about twenty-five miles, and in the spring months, when heavy gales are often experienced.

1. Brownlow, Kangaroo Island.

The first specimen to be noticed in our waters was stranded at Brownlow, near Kingscote, on the north coast of Kangaroo Island, on October 21, 1884, and was presented to the institution by Mr. J. Price. The mounted skeleton hangs in the Museum.

Total length of skeleton, as mounted, 496 cm.

Total length of skull, 123 cm.

The number of vertebrae is: Cervical, 7; thoracic, 17; lumbar, 3; caudal, 14. Total 41.

All cervicals are fused by centra, and neural arches and spines. There were seven chevron bones (second to seventh with skeleton). There are sixteen pairs of ribs, articulated to the second to seventeenth thoracic vertebrae; the tenth to

fifteenth are very broad. The scapula has the acromion broad, flat, and tapering; the coracoid is slender, about as long as the dorsal edge of acromion. Sternum mission.

Skeleton in South Australian Museum, Reg. No. M. 1593.

2. VICTOR HARBOUR, ENCOUNTER BAY.

This is the "very young animal from Encounter Bay" mentioned by Zietz. On September 13, 1887, it became entangled in a fishing net belonging to Mr. M. Rumbelow, and was presented to the Museum by him. When it reached Adelaide it was black in colour, paler below; two photographs of the creature were secured (fig. 1), while a silhouette (dorso-ventral view), cut out from calico-backed paper at the time, furnishes the following measurements of this individual, a juvenile male.

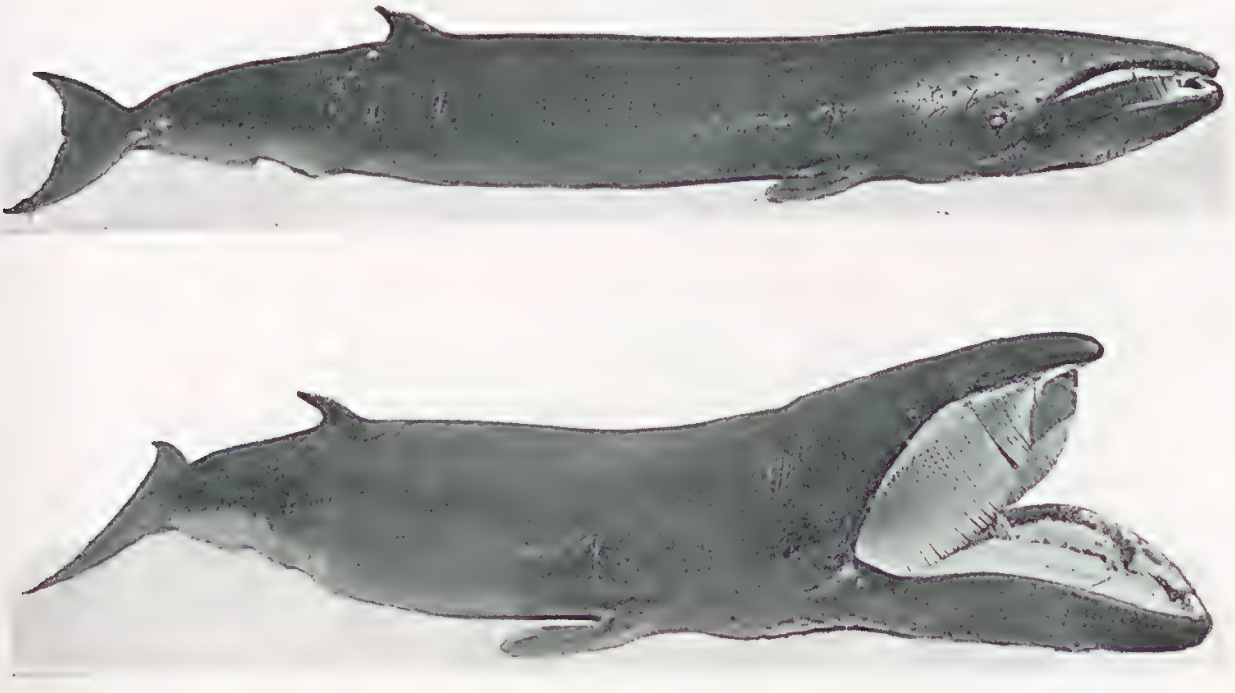


Fig. 1. *Neobalaena marginata:* two views of young male from Victor Harbour.

External Dimensions.

Total length	2770 mm.
Tip of mandible to level of apices of pectoral fins	1100
Width of tail flukes	545
Narrowest width of peduncle	90

Zietz may have secured other details, as he refers to "exact measurements" in his paper, but no other particulars are to be found.

The unmounted skeleton and the baleen are in the Museum. All of the

bones are very light and spongy. The skull is symmetrical, with all the bones easily separable; in lateral view it is considerably less arched than that of the larger Brownlow, Kangaroo Island, example. The premaxillae taper distally, with the inner edges meeting only near tip of snout, and are well separated for the greater part of their length, so that the whole of the vomer is readily visible. The basihyal and thyrohyals are fused, but the suture is distinct.

Length of skull, 700 mm. Baleen: Anterior-posterior length (approx.), 370 mm.; length of longest plate, 200 mm.

The number of vertebrae is: Cervical, 7; thoracic, 17; lumbar, 2; caudal, 14. Total, 40.

All but the cervicals have the epiphyses not, or not completely, anchylosed. The cervicals are fused by centra, neural spines, and (excepting in sixth and seventh) neural arches; centrum of seventh partly free. Spines of first to fourth thoracic vertebrae directed slightly forwards; spine of fifth perpendicular; backward slope of those of remainder successively increasing. Transverse processes successively increasing in length and width to eighth thoracic; similar, and wide and horizontal, in eighth to seventeenth. Lumbar vertebrae similar to last thoracic. The first six caudals bear chevrons, the first and last pairs of which consist of separate pieces. Last neural canal on sixth caudal, which has the transverse process reduced to a slight lateral protuberance fore and aft.

There are sixteen pairs of ribs, articulating to the second to seventeenth thoracic vertebrae. The first is single-headed, much widened distally, the left wider than the right, but of equal length. Second to fourth double-headed. Seventh to thirteenth successively increasing in width, and becoming blade-like; last three successively decreasing in width and length.

The scapula is nearly twice as long as wide. The acromion scarcely tapers, and the coracoid is tiny, relatively much smaller than in the adult.

The sternum is small, irregularly cardiform, with an articular facet on each side for first rib.

Skeleton and baleen in South Australian Museum, Reg. No. M. 2966.

3. Point Marsden, Kangaroo Island.

The second Kangaroo Island specimen was stranded at Point Marsden on or about October 21, 1889. This was a male nearly 11 feet in length. It was brought to the Museum in the flesh, and was there photographed (fig. 2), also some external measurements were made by the late Sir Edward Stirling. The skeleton was cleaned, and later was sent to the Cambridge University Museum by Stirling. A plaster cast of the head, in the flesh, was prepared, and replicas of

this were sent to several Museums. (The printed label with the head-casts incorrectly renders the locality as "Point Moresby, Kangaroo Island.") Unfortunately the baleen was mounted in one of the head-casts thus disposed of.

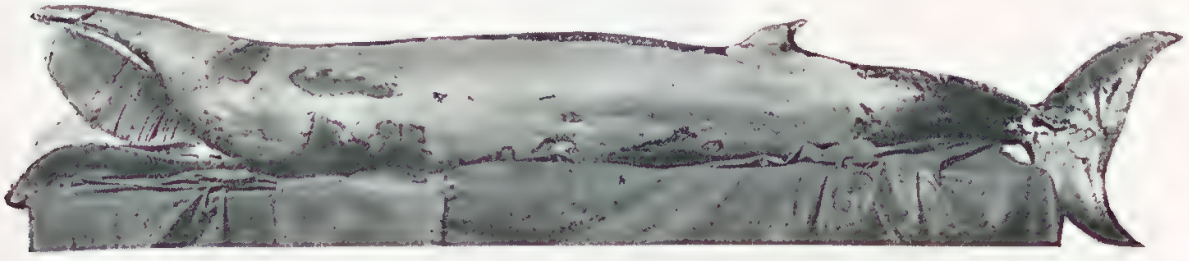


Fig. 2. *Neobalaena marginata:* male from Point Marsden, Kangaroo Island.

With the aid of the photograph, Stirling's sketch, and the cast of the head, it has been possible to prepare the accompanying illustration of this example (fig. 3).

The measurements and notes made by Stirling are given below.

External Dimensions.

	ft.	in.
Total length along curve of back	11	2
Total length, in straight line, to middle of tail flukes	10	10
Tip of sonut to eye	2	4
Tip of mandible to genital slit	7	0
Tip of snout to origin of dorsal fin	7	3
Tip of mandible to axilla (approx.)	3	3
Length of eye-slit	0	1½
Length of pectoral fin, outer margin	1	2
Length of pectoral fin, inner margin	0	9
Length of genital slit	0	10
Length of gape	2	2
Height of dorsal fin	0	5

The head-cast is coloured blackish-green, dark cream beneath. "The eye was black. External portions of baleen plates blackish. This band fades away towards the points. Internal segments ivory white." The latter are now yellow.

Stirling notes also that 5 ft. 9½ in. posterior to the tip of the snout the girth of the body was 6 ft. 3 in. The narrowest part of the caudal peduncle was 1 ft. 6 in. in girth, and its transverse diameter was 3½ in. The ear opening was ⅛ in. in external diameter "diminishing to diameter of a thin wire." The small intestine, from pylorus, was 132 ft. in length, the large intestine, including 6 in.

Fig. 3. *Neobalaena marginata*: male from Point Marsden, Kangaroo Island.

caecum, 5 ft. 6 in. The anus was 9 in. behind the penis, and just admitted the little finger; it had on each side a groove about ½ in. in depth, the grooves diverging anteriorly, being 1 in. apart posteriorly, and 2 in. anteriorly.

Skeleton in Cambridge University Museum. Plaster cast of head in South Aust. Mus. (Reg. No. M. 2967), Brit. Mus., etc.

NEOBALAENA MARGINATA in Bass Strait.

While the above notes were in press Mr. H. H. Finlayson kindly supplied the photograph here reproduced. This shows the right maxilla and baleen of a large specimen which was cast up on West Sister Island, Bass Strait, in June, 1929. The head was split lengthwise before the photograph was taken, so that the inner face of the baleen is shown; the length of one of the longest plates is 69 cm.

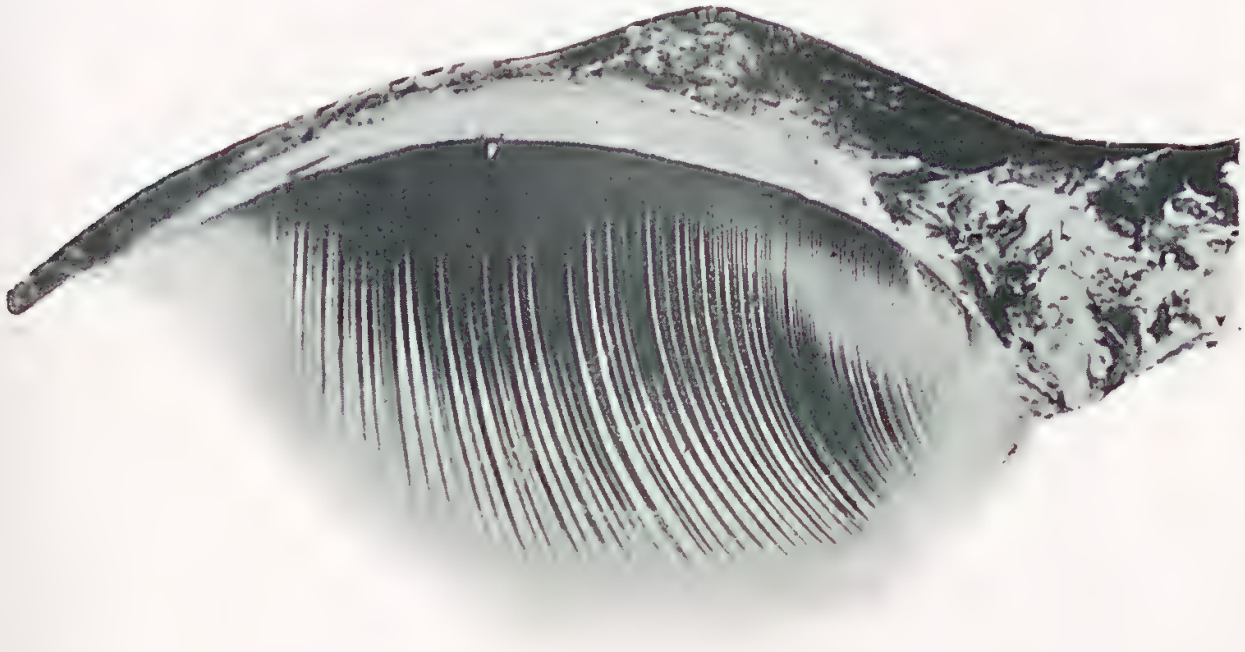


Fig. 4. Right maxilla of *Neobalaena marginata*: Bass Strait. (Photo, Miss R. Y. Blyth.)

The POST-EMBRYONIC DEVELOPMENT of an AUSTRALIAN XANTHID CRAB (*PILUMNUS VESTITUS* HASWELL)

By HERBERT M. HALE, Curator, South Australian Museum.

Figs. 1-17.

Owing to the enthusiasm of my friends, F. A. McNeill (Zoologist at the Australian Museum) and Melbourne Ward (Hon. Zoologist at the same institution), it is now possible to record that *Pilumnus vestitus*, a Xanthid occurring in abundance in favourable situations on the coasts of New South Wales, hatches at an advanced stage of development. Early in September, 1929, these investigators, who have been searching reefs, etc., in New South Wales, and in particular examining marine crabs which are known to bear relatively large ova, were dredging in Sydney Harbour. On this occasion a calm day and a half tide resulted in the exposure of part of the Sow and Pigs Shoal. They landed on the shoal, and, between the wash of the waves, removed quantities of "a pink coralline weed and clusters of black mussels and encrusting sponges," amongst which were great numbers of small *Pilumnus vestitus*. Further search resulted in the capture of "a female with the pleon swollen into a hump, and protecting a writhing mass of progeny," as well as other adults. Owing to the wind and unfavourable tides, it was not possible to visit the shoal again until February 14, 1930. McNeill then found young crab stages of the species to be exceedingly abundant, but could find neither ovigerous females nor females with young. In September 1930, however, he collected a further ten ovigerous females on the reef. The following notes deal with the specimens collected on these occasions.

Pilumnus vestitus Haswell.

Pilumnus vestitus Hasw., Proc. Linn, Soc., N.S. Wales, vi, 1882, p. 753 and Cat. Aust. Crust., 1882, p. 68; Miers, Voy. "Challenger" (Zool.), xvii, 1886, p. 159, pl. xiv, fig. 3; Rathbun, Biol. Res. "Endeavour," v. 1923, p. 110.

The largest specimen examined has the carapace 18·0 mm. in breadth and 12·5 mm. in length.

The pleopods of the adult female (second to fifth abdominal segments)

have the usual slender, jointed endopod, provided with long hairs; the exopod of each is furnished with a dense fringe of plumose hairs, and the margins of the pleon are edged with similar hairs. In the second to fourth pairs of pleopods the exopod is much broader than in the first pair (*cf.* figs. 8a and 8b). The eggs are relatively very large (1·1–1·5 mm. in diameter in females with the carapace 11·5–15·0 mm. in width). Fully laden females each bear about one hundred eggs, and to accommodate these the pleon is held well away from the body. The broad exopods of the pleopods, with their dense plumose marginal hairs overlapping, and in part overlapped by the marginal hairs of the abdomen, then form the sides of a brood pouch, as in *Cryptodromia octodentata* and *Paradromia lateralis* (Hale, 1925, pp. 406 and 410).

The ovigerous female collected in September, 1929, carried only seventeen ova, most of a dark amber colour, eyed, and with the contained embryos almost ready to hatch; three empty egg-shells were attached to the hairs of the pleopods, but no hatched young were present.

In one of the females secured in September, 1930, some of the eggs were hatching, and a few juveniles were partly free from the egg-shell when killed (fig. 16). These emerging young are in a Megalopa stage.

The female with brood young has a carapace 13 mm. in width and 10 mm. in length; seventeen young crabs are lodged under her pleon, and these have the carapace 1·5–1·6 mm. in width and 1·3–1·4 mm. in length. The carapace of the Megalopas mentioned above is of about the same length.

A moderately large series of free-living young crabs under 6 mm. in width was collected. In a spot graph of the measurements (width–length) these small examples clump into five groups. If we regard the brood young crabs as belonging to a first stadium (first crab), on the evidence of this simple biometric grouping the free individuals may be considered as representing the second to sixth crab stadia in the development. The carapace widths in the six stages are:

Young Crab Stadium.	Width of Carapace.
1	1·5–1·6 mm.
2	1·7–1·9 mm.
3	2·2–2·5 mm.
4	2·7–3·0 mm.
5	3·3–3·6 mm.
6	4·5–5·1 mm.

Detailed examination of each group reveals definite developmental changes, and confirms the idea that these are growth stages.

Megalopa.

The Megalopas emerging from the eggs (fig. 16) are soft and flaccid, so that accurate measurements are not possible. The carapace is about as long as in the young crab stage next described, while the pleon also is of approximately the same length and the large pleopods are similar, but lack the long plumose hairs. There is a lateral black pigment patch on each side of the carapace and similar patches on the sternum.

First Crab Stadium.

Colour olivaceous-brown. Carapace a little wider than long (owing to comparatively slight development of branchial regions); regions moderately well-defined. Frons emarginate, relatively much wider than in adult, downbent, and with eight to ten plumose hairs; dorsum of carapace with a few similar

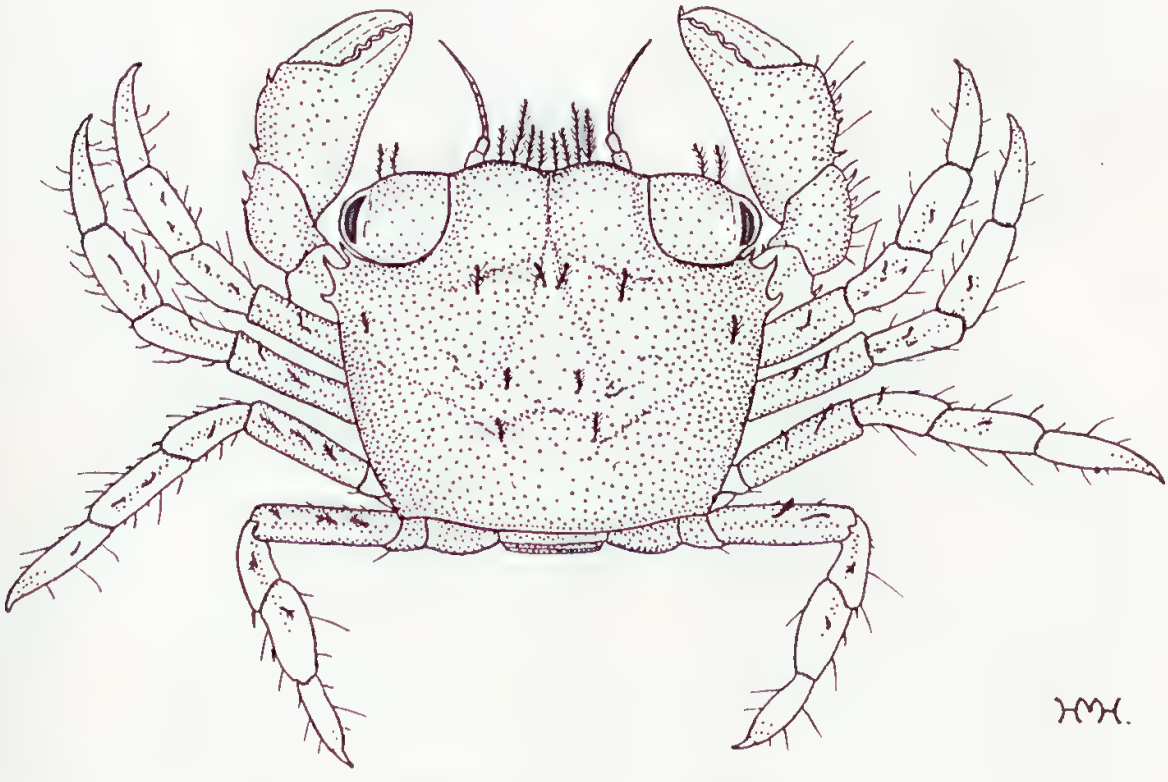
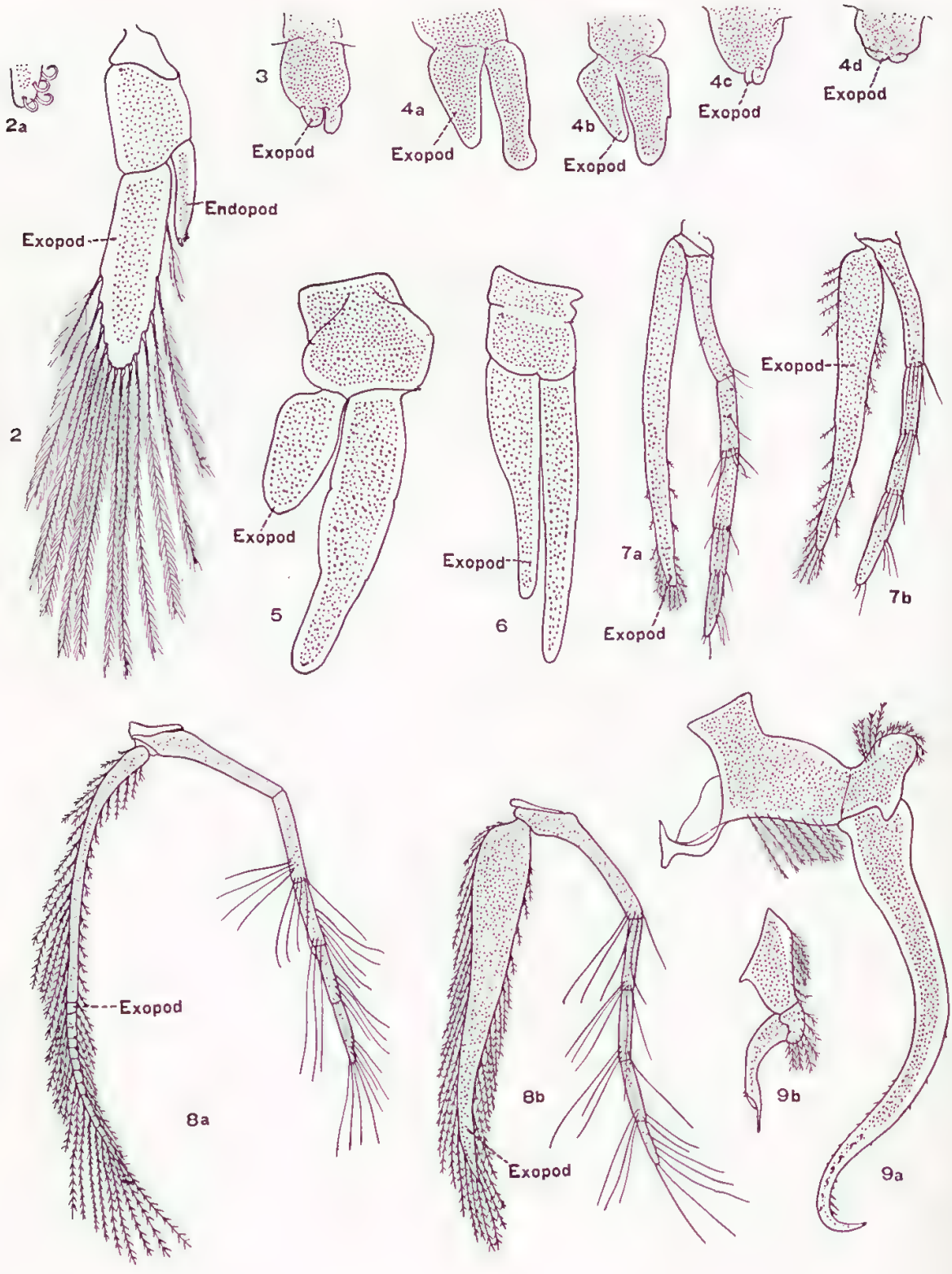


Fig. 1. *Pilumnus vestitus:* first crab stadium (× 30).

hairs. Eyes large. Exterior angle of orbit with a sharp spine, immediately posterior to which are two antero-lateral spines, the more anterior the larger. Postero-lateral margins slightly sinuous and convergent posteriorly. The chelipeds are equal in size, with dorsal edge spiny, and about two-thirds of the outer face furnished with tubercles, some rounded and subconical, and some spine-like, arranged in three or four ill-defined rows, about seven tubercles in each row. Legs with sparse spines and plumose hairs; each dactylus ends in a claw.



Figs. 2–9. *Pilumnus vestitus:* 2, First pleopod of crab of first stadium (× 80); 2a, tip of endopod of same (× 240). 3, Second pleopod of fourth stadium female (× 150). 4a–4d, Pleopods of fifth stadium female (× 150). 5, Second pleopod of sixth stadium female (× 150). 6, First pleopod of female 6 mm. in width (× 60). 7a–7b, First and second pleopods of female 8 mm. in width (× 24). 8a–8b, First and second pleopods of adult female (× 10). 9a–9b, Pleopods of male 9 mm. in width (× 19).

The antennae and mouth-parts are much as in the adult. The second antennae have nine to ten joints in the flagellum, and have a small exopod. The maxillae have the joints less elongate than in the adult, the ischium of the third pair being as wide as long.

The pleon (fig. 10) is bent under the cephalothorax, and is similar throughout the series of first crabs. It is seven-segmentate, the first segment widest (0·45 mm.), and is convex from side to side; the sixth segment is shorter than any of the others, the telson is equal in length to the fifth, and the second to fourth segments are subequal in length, each a little longer than the telson. The posterior border of the telson is concave.

The outer surface of the pleon bears very sparse, short, plumose hairs. The second to fifth segments bear pleopods, each consisting of a protopod, an exopod provided with long plumose marginal hairs, and a much narrower endopod, only one-half the length of the exopod, and with three to four distal hooks (fig. 2, 2a). The pleopods decrease in size backwards, being respectively 0·53 mm., 0·48 mm., 0·43 mm., and 0·38 mm. in length, exclusive of the fringing hairs, which project considerably beyond the telson.

Width of carapace, 1·5–1·6 mm.; length of carapace, 1·3–1·4 mm.; interocular space. 0·6–0·7 mm.

Second Stadium.

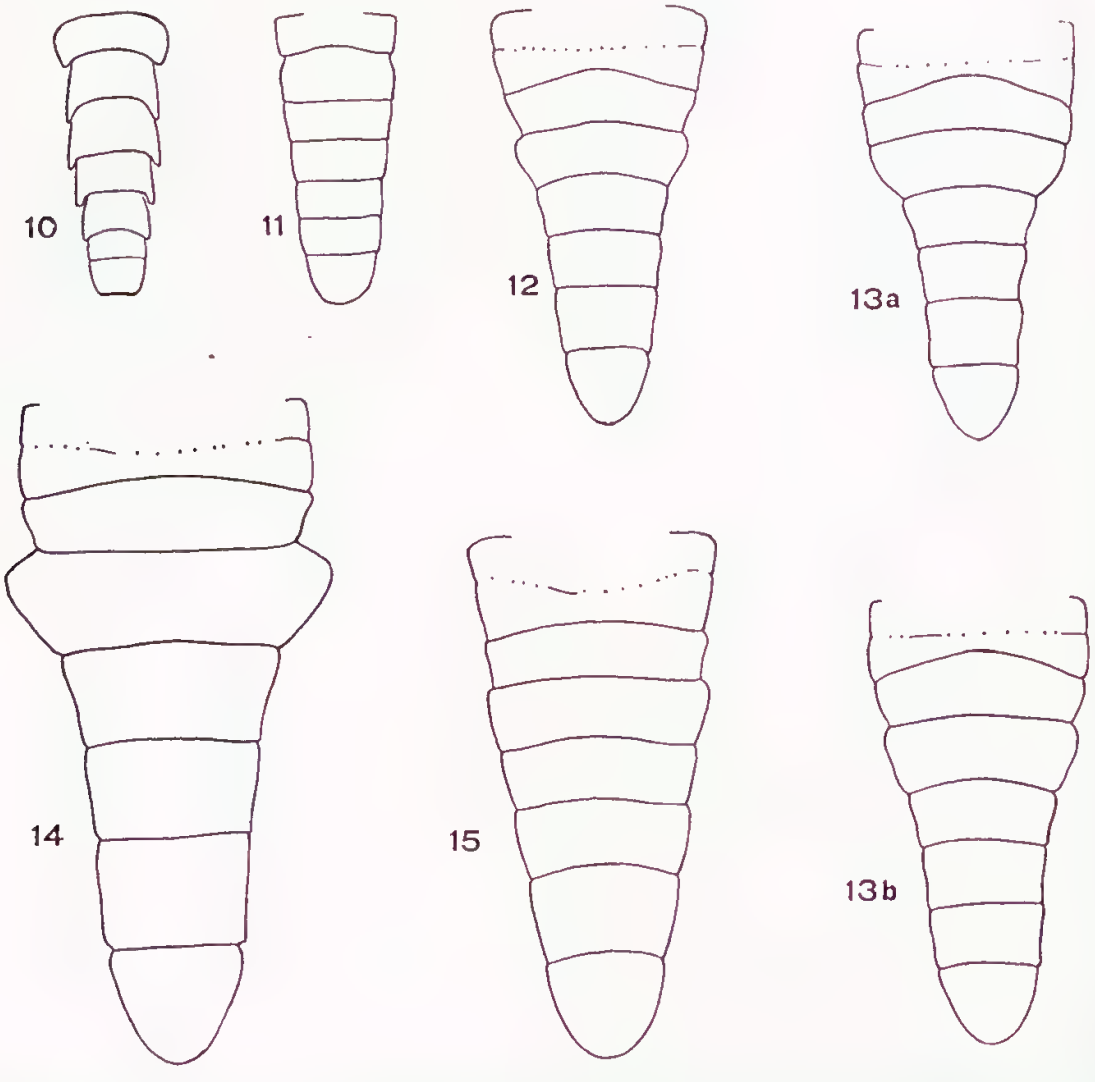
Carapace still with only two antero-lateral spines behind the spine of the exterior orbital angle. The abdomen is alike throughout the series of second crabs (fig. 11); it is relatively wider than in the first crab, while the posterior margin of the telson is rounded, not concave, and externally it is less convex from side to side. Pleopods are entirely absent. The lateral and posterior margins have a sparse fringe of plumose hairs; the sixth segment is shorter than any of the others; the telson is longer than the fifth, and subequal to the second, which is the longest segment; the third to fifth segments are subequal in length. Width of carapace, 1·7–1·9 mm.; length of carapace, 1·4–1·5 mm.; interocular space, 0·7–0·9 mm.

Third Stadium.

An additional small antero-lateral spine is apparent, immediately posterior to those described above. The pleon has altered considerably in shape, and the lateral margins of the third segment, which is wider than any of the others, bulge outwards, instead of being only slightly convex as in the preceding stadium. Minute anlagen of the adult pleopods are apparent on the first and second segments in the male, and on the second to fifth segments in the female.

The abdomen is alike throughout the series; the sixth segment is subequal in length to each of the second to fifth segments, and the telson is slightly longer.

Width of carapace, 2·2–2·5 mm.; length of carapace, 1·6–1·8 mm.; interocular space, 0·9–1·1 mm.



Figs. 10–14. Pleon in young crab stadia of *Pilumnus vestitus:* 10, First stadium (× 23). 11, Second stadium (× 23). 12, Fifth stadium female (× 17). 13, Sixth stadium: a, male; b, female (× 17). 14, Male with carapace 10·5 mm. in width (× 10). 15, Female with carapace 8 mm. in width (× 10).

Fourth Stadium.

The pleon still exhibits no sexual differentiation insofar as shape is concerned, and the pleopod buds are still minute.

The first abdominal appendage of the male is spiniform with hooked end and the second is tubular.

Small exo- and endopods are apparent in the pleopods of the female; the

two anterior pairs (fig. 3) are a little longer than the two posterior. The endopod, which is longer than the exopod, is 0·03 mm. in length in the first pair and 0·02 mm. in the second.

The sixth segment of the pleon is slightly longer than any of the second to fifth segments, which are subequal in length; the telson is one-fourth as long again as the sixth segment.

Width of carapace, 2·7–3·0 mm.; length of carapace, 1·9–2·2 mm.; interocular space, 1·2–1·4 mm.

Fifth Stadium.

The most posterior of the antero-lateral spines of the carapace is now as prominent as the others. The pleon scarcely differs in shape in the sexes (fig. 12).

The male pleopods are respectively 0·12 mm. and 0·13 mm. in length; in general form their apices are much as in the adult, but the first pair bear only a few short spines.

It is now apparent that the two posterior pairs of pleopod buds of the female are lagging in development, the first two pairs being much the largest (figs. 4a-4d). The endopods, which are one-third as long again as the exopods, are respectively 0·12 mm., 0·09 mm., 0·01 mm., and 0·01 mm. in length. The pleopods have no marginal hairs, but the endopod in the first two pairs has a constriction indicative of two segments.

Width of carapace, 3·3–3·6 mm.; length of carapace, 2·4–2·6 mm.; interocular space, 1·4–1·6 mm.

Sixth Stadium.

The male is now readily separable from the female by the shape of the pleon alone. In the female this is much as in the preceding stage, but in the male is narrower posterior to the third segment (*cf.* figs. 13a and 13b). The proportionate lengths of the segments are much as in the fourth stadium in this and the fifth stage.

The pleopods have increased considerably in size. Those of the female still have no marginal hairs, but in the two anterior pairs the endopod has marginal incisions indicative of three segments (fig. 5); the endopods are two to three times as long as the exopods, and are respectively 0·29 mm., 0·23 mm., 0·15 mm., and 0·09 mm. in length.

Width of carapace, 4·5–5·1 mm.; length of carapace, 3·5–4·0 mm.; interocular space, 2·0–2·5 mm.

Seventh Stadium.

A female with the carapace 6 mm. in width probably represents the seventh crab stage. The branches of the pleopods are relatively narrower, and much more elongate, than in previous stadia (fig. 6); in the two anterior pairs the endopod has marginal incisions indicating four segments. The lengths of the endopods are respectively 0·55 mm., 0·55 mm., 0·37 mm., and 0·30 mm..

Width of carapace, 6·0 mm.; length of carapace, 4·2 mm.; interocular space, 2·9 mm.

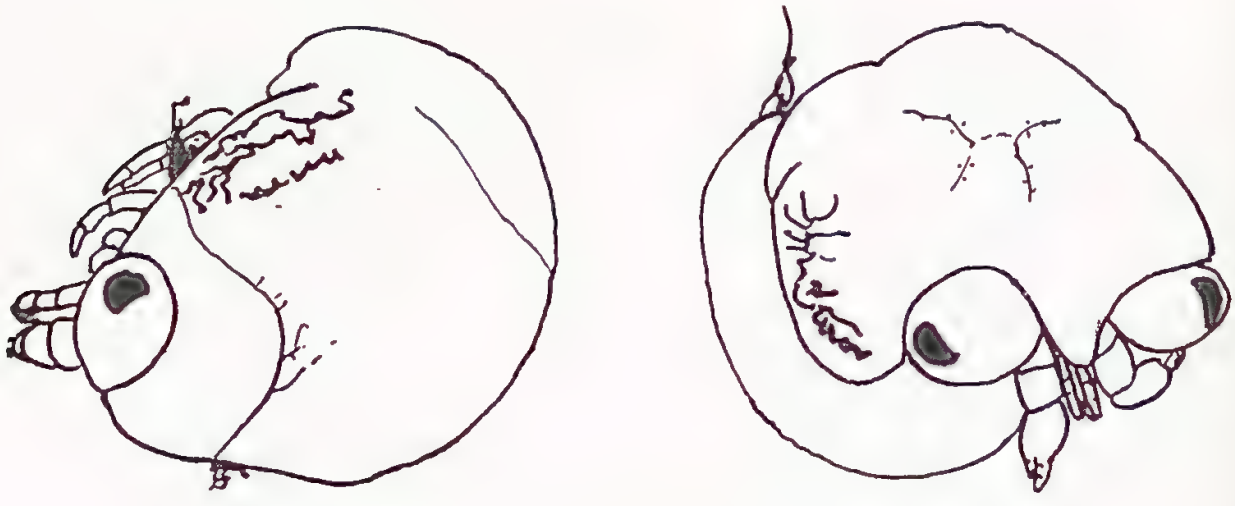


Fig. 16. Megalops of *Pilumnus vestitus* emerging from eggs (× 30).

Subsequent Stages.

In examples with a carapace width of 8–9 mm. (? eighth or ninth young crab stadium) the male pleopods have attained a length of 3·0 mm. and 0·8 mm. (figs. 9a and 9b), and in all essentials are similar to those of the adult; they are, of course, much smaller, and the spines of the first pair are fewer in number. The rami of the pleopods of the female approximate more nearly in length, but the endopod is still slightly longer than the exopod; the endopod is indistinctly three- to five-segmentate, and bears long simple hairs. The exopod bears plumose hairs on the distal portion, and is narrower in the first pleopods than in the others (figs. 7a and 7b). The respective lengths of the endopods are 2·0 mm., 1·8 mm., 1·4 mm., and 1·1 mm.

As the crab grows the following usual changes also occur. The chelipeds become relatively stronger, and one (usually the right) becomes larger than the other; they exhibit little or no sexual dimorphism. The hairs on the frons increase in number, and the clothing of the carapace typical of the adult (pubescence mixed with long hairs) develops. The carapace alters slightly in shape

after each moult, the branchial chambers increasing in relative bulk, so that the cephalothorax becomes proportionately wider and the interocular space narrower (fig. 17). The maxillae and maxillipeds become more elongate and the epipods of the thoracic appendages relatively longer and more attenuated. The gills increase greatly in relative size, the flagellum of the second antennae develops more joints, etc.

DISCUSSION.

The most interesting features in connection with the life cycle of *Pilumnus vestitus* are: the emergence of the Megalopa direct from the egg; the sedentary habit of the Megalopa; the development of natatory pleopods in the first young crab stadium; and the subsequent development of the secondary sexual characters.

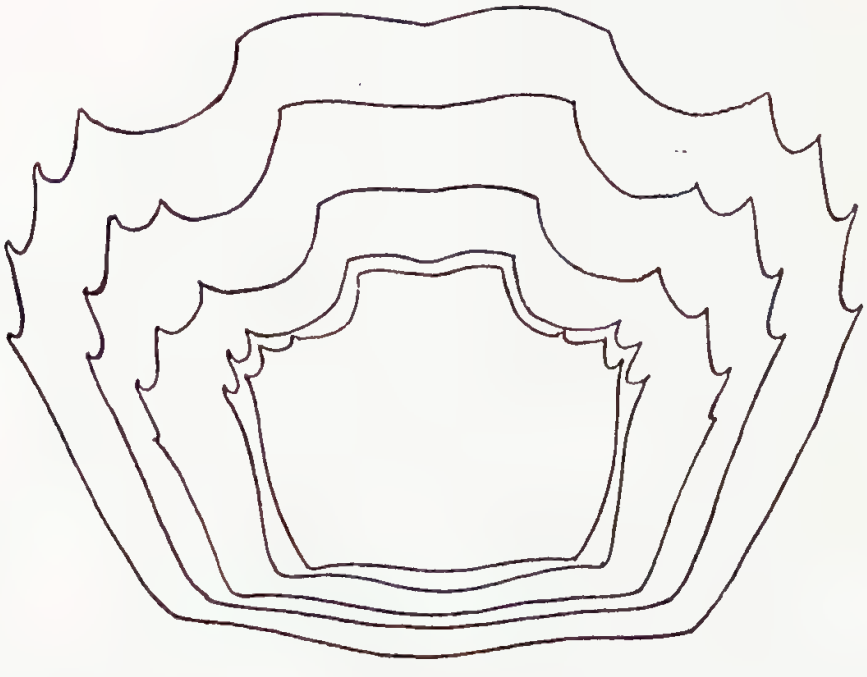


Fig. 17. Outline of carapace in first to fifth young crab stadia of *Pilumnus vestitus* (× 25).

As a young crab stage occurs beneath the apron of the female it is obvious that the Megalopa does not swim.

Three distinct stages are evident in the metamorphosis of the abdomen of the young crabs: (a) the first crab stadium has the pleon undifferentiated sexually, and the pleopods are modified solely for swimming; (b) in the second stadium it has changed to an intermediate type, lacks all external trace of appendages, and still exhibits no indication of sex; (c) in the third crab stadium the influence of sex becomes apparent, and the buds of the adult pleo-

pods are discernible; the secondary sexual characters, the differentiation in shape and the development of the adult appendages, commence almost together, and in the sixth stadium the difference in shape alone is apparent. In succeeding stages the pleon and its appendages progress rapidly towards the adult form.

The pleopods of the first crab stadium resemble closely those described for the Megalopa stage of other Brachyura, but otherwise the young crab facies is typical; there is no doubt that the distal endopodal hooks (fig. 2a) of these appendages serve to link together the pleopods of a segment, so that each pair beats synchronously.

In some other orders of Crustacea the pleopods have similar coupling-hooks. In the Isopoda the protopod bears hooks, and in the Stomatopoda they are developed on a short appendage of the endopod. In the case of the Megalops type of pleopod the whole endopod is reduced, but the enlarged exopod, with its dense fringe of long, plumose hairs, forms an efficient swimming-paddle.

It has been shown that the first crab stages of many Brachyura do not swim, and that the maximum development of the natatory pleopods is attained in the Megalopa stage. In the first crab these apparently usually commence to degenerate in size (see, for instance, Lebour, 1927, p. 808, *Macropodia longirostris;* and Williamson, 1903, p. 160, *Carcinides maenas;* and Hyman, 1924b, p. 5, *Pachygrapsus marmoratus*), or while remaining large, lack plumose hairs (Williamson, 1911, pp. 8 and 12, *Portunus holsatus* and *P. puber*). The swimming pleopods may even commence to shrivel towards the end of the Megalops stage (Hyman, 1922, p. 456, *Uca pugilator*), and the degeneration may further continue into the second and even third young crab stages. Hyman states that the anlagen of the adult pleopods do not appear in *Uca pugilator* until the fourth young crab stage (Hyman, 1920, p. 499). In *Pilumnus vestitus,* however, the natatory pleopods are fully developed later in the cycle, and the transition is more abrupt. Considering the conditions under which the species was living at the Sow and Pigs Shoal, "between the wash of the waves," the possession of swimming appendages suggests the possibility that the first crab may leave the parental protection before moulting, and that the pleopods are utilized until a footing is secured, or in order to obtain a new footing, or to venture about in search of food; the second young crab stage has no natatory organs, so that if ecdysis of the first crabs occurred beneath the maternal apron, the swimming pleopods would not be required, and it would seem strange that they have not at least commenced to atrophy, instead of attaining their maximum development at this stage.

The first crab stadia of the Dromiid crabs, *Cryptodromia octodentata* and

Paradromia lateralis (Hale, 1925), also possess natatory pleopods; these species likewise occur commonly on wave-washed reefs.

It seems, on the other hand, that swimming pleopods may be developed in the young crab and not be used; this is said to be the case in the first crab stadium of the Pinnotherid *Pinnixa sayana*, where the pleon is "not used as a swimming organ" (Faxon, 1879, and Hyman, 1924, pp. 6-7, fig. 65). In this species there is no Megalops stage, the first crab immediately following the last zoea.

"Direct" development, or an "abbreviated metamorphosis," while not the rule in marine Decapoda, may occur more commonly than might be imagined, particularly amongst shallow-water forms. The eggs are large, and the young hatch in the form of the adult, and cling to the parental pleopods for a time, in one or more representatives of each of the families Majiidae (Rathbun, 1914), Dromiidae (Montgomery, 1922, and Hale, 1925), Axiidae (Hale, 1927, pp. 84 and 86), and Paguridae (Hale, 1927, pp. 88 and 95). Metamorphosis is curtailed in some other marine Decapoda (Macrura, Anomura, and Brachyura), although the young do not emerge from the egg in the form of the adult.

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PELECYPODA OF THE FLINDERSIAN REGION, SOUTHERN AUSTRALIA

No. 2 (1)

By BERNARD C. COTTON, Assistant Conchologist, South Australian Museum.

Figs. 1-18.

The abundant material obtained by Sir Joseph C. Verco, and generously donated to the South Australian Museum, contains so many new species, and has provided so much unrecorded data, that a revision of this nature seems inevitable.

The exact type locality is given herein for many species, where their author failed to quote it.

It is interesting to note that of the one hundred and thirty species mentioned in this paper, seventy-seven are confined to the region east of St. Francis Island, and sixteen to the region west. Thirty-seven are common to both regions.

Family PHILOBRYIDAE.

Philobrya cuboides Verco.

Loc. Backstairs Passage, 20 fathoms (type); Beachport to Ellensbrook, 20 to 120 fathoms.

Fig. 1. *Philobrya tardiradiata* sp. nov.

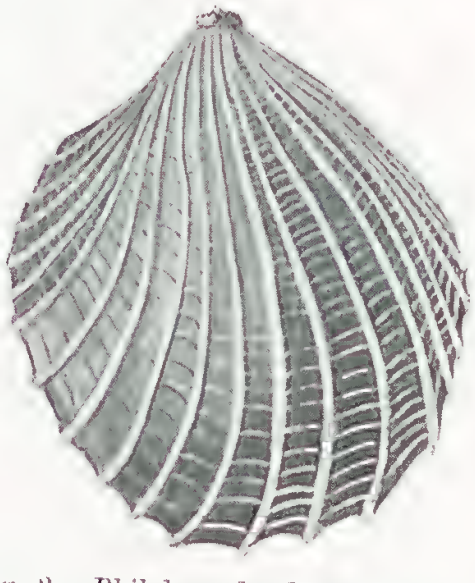

Fig. 2. *Philobrya bordaensis* sp. nov. (Bernard C. Cotton *del.*).

(1) No. 1 in the Rec. S. Aust. Mus., iv; No. 2, p. 223, 1930.

PHILOBRYA PECTINATA Hedley.

Loc. Beachport to Cape Wiles, 90 to 200 fathoms.

PHILOBRYA FIMBRIATA Tate.

Loc. Gulf St. Vincent (according to Tate's label; type); Port Phillip to 40 miles west of Eucla, 7 to 200 fathoms.

PHILOBRYA TATEI Hedley.

Three valves from the following locality are typical.

Loc. Cape Borda, 55 fathoms.

PHILOBRYA TARDIRADIATA sp. nov.

Fig. 1.

Obliquely oval; prodissoconch indistinct, small; radial ribs confined to lower half of the shell, concentric striae very fine; ventral margin crenulate within; hinge-line straight, oblique.

Loc. Guichen Bay, 1·5 mm. x 2 mm. (type, in S. Aust. Mus., Reg. No. D. 10127); Guichen Bay to St. Francis Island, down to 35 fathoms.

PHILOBRYA BORDAENSIS sp. nov.

Fig. 2.

Obliquely oval, ventricose, prodissoconch small; twenty fine, smooth radial ribs, interspaces crossed by close concentric striae; ventral margin strongly crenulate within.

Loc. North-west of Cape Borda, 62 fathoms, 1·8 mm. x 2 mm. (type, in S. Aust. Mus., Reg. No. D. 10128); Beachport to 80 miles west of Eucla, 40 to 80 fathoms.

PHILOBRYA CREBRERADIATA sp. nov.

Fig. 3.

Thin, white, translucent; quadrately oval; umbo acute, prominent and small; dorsal margins form a right angle, one straight, the other slightly convex; radials very numerous and fine; ventral margin convex.

Loc. Ellensbrook, Western Australia, 2·6 mm. x 3 mm. (type, in S. Aust. Mus., D. 10129).

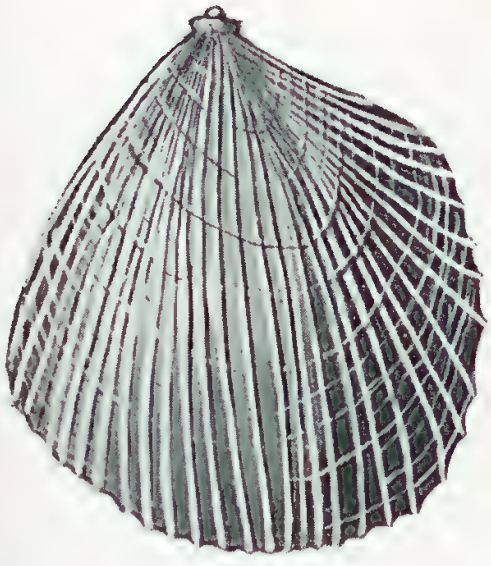

Fig. 3. *Philobrya crebreradiata* sp. nov.

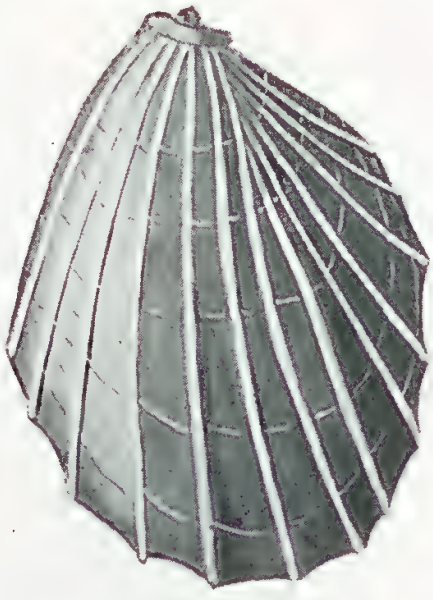

Fig. 4. *Philobrya celsa* sp. nov. (Bernard C. Cotton *del.*).

PHILOBRYA CELSA sp. nov.

Fig. 4.

White, elongate-oval, ventricose; dorsal margins straight, at a right-angle; prodissoconch distinct; fourteen fine radials from apex to base, interspaces wide; ventral margin semi-ovate, slightly concave between the ribs.

Loc. Guichen Bay; 2·2 mm. x 3·2 mm. (type, in S. Aust. Mus., Reg. No. D. 10130).

NOTOMYTILUS RUBER Hedley *(Philippiella).*

Loc. MacDonnell Bay to Kingston, down to 200 fathoms.

NOTOMYTILUS ROBENSIS sp. nov.

Fig. 5.

Shell triangularly ovate; apex sharply rounded, acute, terminal; dorsal margins almost straight and equal in length; epidermis fawn, shell white translucent; faint accremental striae correspond with folds of the epidermis.

Loc. Robe, 2 mm., x 2·6 mm. (type, in S. Aust. Mus., Reg. No. D. 19131) to Cape Jaffa, down to 130 fathoms.

Specimens vary somewhat in comparative width.

Diagnosis. From *N. ruber* Hedley. Fawn coloured, not red. Has not the concave antero-dorsal margin.

MICROMYTILUS gen. nov.

Shell obliquely oval, without prodissoconch, umbo not quite terminal; anterior margin uniformly convex; hinge teeth in an anterior and posterior series, the two

series not overlapping but separated by an oblique cartilage pit; teeth becoming larger laterally; hinge plate long and straight. This genus is proposed for *Myrina crenatulifera* Tate, which he afterwards transferred to *Philobrya*. Hedley placed it in the genus *Notomytilus*, together with *Philippiella ruber* Hedley, which he named as type. *Notomytilus* has a terminal umbo and two overlapping parallel series of teeth, separated by a very long, narrow cartilage pit, and the hinge plate curved.

Fig. 5. *Micromytilus robensis* sp. nov.

Fig. 6. *Micromytilus francisensis* sp. nov. (Bernard C. Cotton *del.*).

MICROMYTILUS CRENATULIFERA Tate.

Loc. MacDonnell Bay to St. Francis Island down to 200 fathoms.

MICROMYTILUS FRANCISENSIS sp. nov.

Fig. 6.

Elongately-rhomboidal, umbo rounded, projecting; hinge plate straight and long, at about 45° with the vertical central axis; ventral margin semicircular, feebly crenulate internally, posteriorly; surface smooth but for very fine accremental striae; dark brown, with blackish-brown about the umbonal and middle areas, disposed in various patches in different individuals.

Loc. St. Francis Island; 1·5 mm. x 2·3 mm. (type, in S. Aust. Mus., Reg. No. D. 10132).

Diagnosis. From *M. crenatulifera* Tate. There are no radials, and the antero-dorsal margin is almost straight, not regularly convex.

FAMILY RENIELLIDAE.

RENIELLA SPONGIARUM Lamarck.

Loc. Kingston to Geraldton.

FAMILY OSTRAEIDAE.

OSTREA SINUATA Lamarck.

Loc. Beachport to Albany, down to 96 fathoms.

OSTREA GLOMERATA Gould.

Loc. South Australia: Coffins Bay and St. Francis Island. Western Australia: Albany and Fremantle.

OSTREA MORDAX Gould.

Loc. Fremantle and Broome.

FAMILY TRIGONIIDAE.

NEOTRIGONIA BEDNALLI Verco.

Loc. Beachport to Fremantle, down to 200 fathoms.

FAMILY SPONDYLIDAE.

SPONDYLUS TENELLUS Reeve.

Loc. South Australia to Rottnest, down to 15 fathoms.

FAMILY LIMIDAE.

AUSTRALIMA NIMBIFER GEMINA Iredale *(Lima).*

Loc. Beachport to Fremantle.

Lima squamosa, multicostata, and *lima* do not occur in South Australia.

AUSTRALIMA SPECTATA Iredale.

This South Australian species has neither been described nor figured.

Loc. Forty miles South of Cape Wiles, 100 fathoms. (Specimens in Australian Museum.)

LIMA ORIENTALIS Adams and Reeve.

Loc. Beachport to Fremantle, down to 200 fathoms.

LIMATULA STRANGEI Sowerby *(Lima).*

Loc. Beachport to Bunbury, down to 300 fathoms.

ESCALIMA MURRAYI RELEGATA Iredale.

Loc. Beachport to 120 miles west of Eucla, down to 300 fathoms.

GEMELLIMA AUSTRINA Tate *(Limea).*

Loc. Beachport to Bunbury, 12 to 300 fathoms.

GEMELLIMA PARVULA Verco *(Limea).*

Loc. Cape Jaffa to 90 miles west of Eucla, down to 140 fathoms.

FAMILY ANOMIIDAE.

MONIA IONE Gray.

Loc. Beachport to Bunbury.

FAMILY MYTILIDAE.

MYTILUS PLANULATUS Lamarck.

Loc. Beachport to Fremantle.

TRICHOMYA HIRSUTA Lamarck *(Mytilus).*

Loc. South Australia.

TRICHOMYA PENETECTA Verco *(Modiolus).*

Loc. South Australia.

TRICHOMYA EROSA Lamarck *(Mytilus).*

Loc. MacDonnell Bay to Shark Bay.

TRICHOMYA ROSTRATA Dunker *(Mytilus).*

Loc. South Australia.

SEPTIFER BILOCULARIS Lamarck *(Mytilus).*

Loc. Yallingup, Shark Bay, Geraldton, Carnarvon, Moreton Bay.

MODIOLUS DELINIFICUS Iredale *(Mytilus).*

Loc. Beachport to Albany.

MODIOLUS AREOLATUS Gould.

Loc. Beachport to Fremantle, down to 35 fathoms.

MODIOLUS FLAVIDUS Angas.

Loc. South Australia to King George Sound, down to 28 fathoms.

MODIOLUS LINEUS Hedley.

Loc. Beachport to 40 miles west of Eucla, 72 to 300 fathoms.

MODIOLUS PROJECTUS Verco.

Loc. Beachport, 200 fathoms, one right valve.

MODIOLUS PULEX Lamarck.

Modiolus confusus Angas is a synonym.
Loc. Guichen Bay to Bunbury.

MODIOLUS INCONSTANS Dunker.

Modiolus semivestita Tate is a synonym.
Loc. Yankalilla to Bunbury.

MODIOLUS GLABERRIMUS Dunker.

Loc. Fremantle, 10–12 fathoms.

AMYGDALUM BEDDOMEI Iredale.

South Australian specimens appear to be the same as the Tasmanian species.
Loc. South Australia to King George Sound, down to 75 fathoms.

MUSCULUS NANA Dunker *(Lanistina)*.

According to Reeve's illustration, *Lanistina nana* Dunker is the fry of the South Australian shell misidentified by Tate as *Modiolaria cummingiana* Reeve and by Verco as *Modiolaria impactus* Herman. *Crenella paulucciae* Crosse and Fischer is quite a distinct species, as shown by its shape.
Loc. Beachport to Geraldton, down to 130 fathoms.

MUSCULUS PAULUCCIAE Crosse and Fischer *(Crenella)*.

Loc. Beachport to Geraldton, down to 40 fathoms.

MUSCULUS SEMIRADIATA Verco *(Modiolaria)*.

This species has five very faint radials at the anterior end, in addition to the numerous fine radials at the posterior end.
Loc. Cape Jaffa, 130 fathoms, one valve.

SOLAMEN RECENS Tate *(Arcoperna)*.

One broken valve, typical; 20·5 mm. measured umbo-ventrally.
Loc. Cape Jaffa, 130 fathoms.

EXOSIPERNA SCAPHA Verco *(Arcoperna)*.

Loc. Off Cape Jaffa, 90 fathoms (type); Beachport to King George Sound, 15 to 200 fathoms.

Fig. 7. *Exosiperna concava* sp. nov. (Bernard C. Cotton *del.*).

EXOSIPERNA CONCAVA sp. nov.

Fig. 7.

Ovate, solid, white; concave ventrally, slightly produced ventrally, umbo slightly prominent, prodissoconch small, smooth; numerous denticles on the hinge plates; anterior hinge plate projects into the cavity of the shell beneath the umbo; inner margin finely denticulate; external surface sculptured with numerous fine striae.

Loc. Backstairs Passage, 110 fathoms, 2·2 mm. x 3·2 mm. (type, in S. Aust. Mus., D. 10135); Beachport to King George Sound, down to 110 fathoms.

Diagnosis. From *E. scapha* Verco. Readily distinguished by the markedly concave ventral margin.

TRICHOMUSCULUS BARBATUS Reeve *(Lithodomus)*.

Loc. Beachport to Yallingup, down to 200 fathoms.

LITHODOMUS CUNEIFORMIS Tate.

Loc. Both Gulfs, Kangaroo Island, down to 25 fathoms.

LITHOPHAGA GRACILIS Phil.

Loc. Shark Bay (E. Ashby).

FAMILY GAIMARDIIDAE.

GAIMARDIA TASMANICA Beddome.

Loc. MacDonnell Bay to Venus Bay, down to 90 fathoms.

NEOGAIMARDIA gen. nov.

This genus is introduced for the following new species, *C. perplexa*. It is closely related to *Gaimardia*, but differs in lacking the concavity of the ventral margin and in the dentition of the hinge.

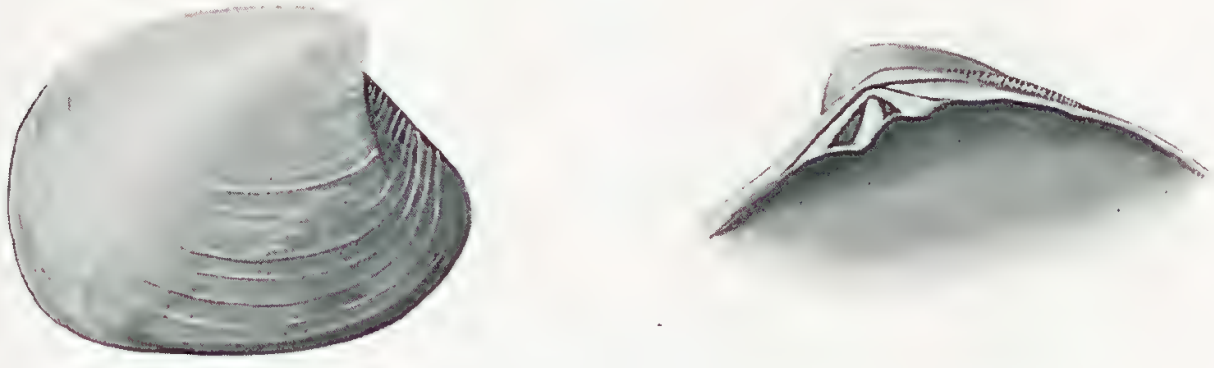

Fig. 8. *Neogaimardia perplexa* sp. nov. (Bernard C. Cotton *del.*).

NEOGAIMARDIA PERPLEXA sp. nov.

Fig. 8.

The type species of the above genus. Trapezoidal, thin ventricose; sharply rounded anteriorly, widely rounded posteriorly; smooth except for accremental striae; brown about the umbos, fading to yellow towards the margins; hinge with a U-shaped tooth, a small tooth between the arms of the U, and one posterior.

Loc. Port Lincoln, 9 fathoms; 5·3 mm. x 4 mm. (Type, in S. Aust. Mus., Reg. No. D. 10145.)

FAMILY LATERNULIDAE.

LATERNULA CRECCINA Reeve.

Loc. South Australia: Bunbury, Fremantle, down to 28 fathoms.

LATERNULA RECTA Reeve.

L. recta replaces *L. gracilis*, a Queensland species formerly listed as South Australian.

Loc. South Australia.

FAMILY PERIPLOMATIDAE.

OFFADESMA ANGASI Crosse & Fischer *(Cochlodesma).*

Loc. South Australia.

FAMILY THRACIIDAE.

EXIMIOTHRACIA MYADOROIDES Smith *(Thracia).*

Loc. Beachport to Rottnest, down to 40 fathoms.

EXIMIOTHRACIA SPECIOSA Angas *(Thracia).*

Loc. Beachport, Neptune Island, and Newland Head, down to 110 fathoms.

EXIMIOTHRACIA LINCOLNENSIS Verco *(Thracia).*

Loc. Port Lincoln, 9 fathoms (type, in S. Aust. Mus.); Yankalilla Bay to Port Lincoln, 9–24 fathoms.

EXIMIOTHRACIA CONCENTRICA Verco *(Thracia).*

Loc. South Australia.

THRACIOPSIS ANGUSTATA Angas.

Loc. Beachport to Rottnest, 12–200 fathoms.

THRACIDORA ARENOSA Hedley.

Loc. Beachport to 120 miles west of Eucla, down to 300 fathoms.

NOTOMYA gen. nov.

A number of diverse forms, both recent and fossil, have been referred to the genus *Pholadomya*. *P. tasmanica*, however, is quite different in shape and sculpture, and should not be located in that exotic genus. *P. tasmanica* Hedley and May, is here made the type of the new genus *Notomya*. The authors (2) gave an exhaustive description of the species.

NOTOMYA TASMANICA Hedley and May *(Pholadomya).*

One fragmentary specimen from 35 miles south-west of Neptune Island, 104 fathoms, appears to be this species.

FAMILY MYADORIDAE.

MYADORA IREDALEI sp. nov.

A careful examination of South Australian specimens of the genus *Myadora* convinces me that *M. albida* T.-Woods does not occur there. Specimens from

(2) Hedley & May, Proc. Malac. Soc. p. 132, 1914.

South Australia previously diagnosed as this species are the *M. corrugata* Verco, which is more produced and narrower posteriorly. However, Verco's name was used previously by Tate (3) for a fossil (as pointed out by Iredale) (4). I therefore propose the name *M. iredalei* sp. nov. to replace *M. corrugata* Verco.

Verco's type, and therefore the type of the present species, is from Yankalilla Bay, 20 fathoms. In S. Aust. Mus., Reg. No. D. 10161.

Loc. Beachport to Bunbury, down to 200 fathoms.

MYADORA BREVIS Stutchbury.

Loc. Beachport to King George Sound, down to 110 fathoms.

MYADORA PERVALIDA sp. nov.

Fig. 9.

Oblong-ovate, solid, anterior rounded, posterior truncate; right valve convex, clasping the left all round, concentrically sculptured with twenty-four prominent ribs, half the width of the interspaces; a raised rib runs from the umbo to the postero-ventral margin; left valve very slightly concave, similarly though slightly less validly sculptured.

Loc. St. Francis Island, 20 fathoms, 30 mm. x 23 mm. (type, in S. Aust. Mus., Reg. No. D. 10149); Beachport to Bunbury, down to 150 fathoms.

This species was formerly recorded from South Australia as *M. ovata* Reeve, a Philippine Island shell, very different in sculpture.

Diagnosis. Consistently more strongly sculptured than the Peronian *M. complexa* Iredale.

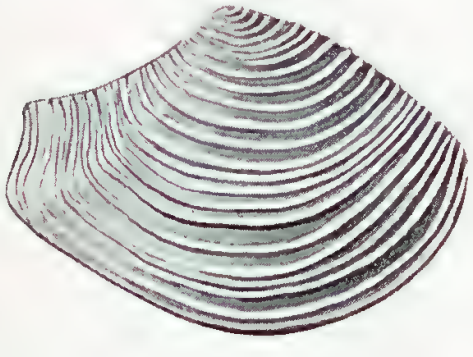

Fig. 9. *Myadora pervalida* sp. nov.

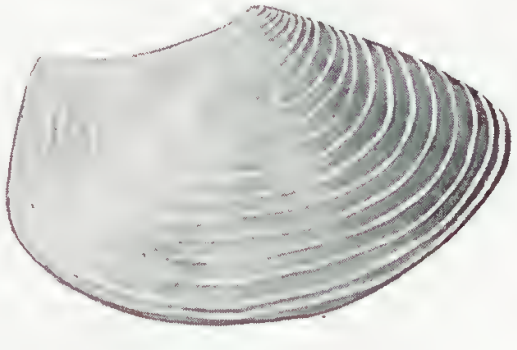

Fig. 10. *Myadora royana delicata* subsp. nov. (Bernard C. Cotton *del.*).

MYADORA PANDORIFORMIS Stutchbury.

After careful examination of the Flindersian *Myadora* in the South Australian Museum, I am unable to find any specimens referable to this species.

(3) Tate. Trans. Roy. Soc. S. Austr., ix, p. 175, pl. xvii, figs. 11a-b.

(4) Iredale. P.L.S.N.S.W., xlix, pt. 3, p. 200, 1924.

MYADORA SUBALBIDA Gatliff and Gabriel.

Two valves dredged by Sir Joseph Verco appear to be this species.

Loc. Beachport, 40 and 50 fathoms; Backstairs Passage, 20 fathoms.

MYADORA ELONGATA May.

This Tasmanian species has not been recorded hitherto from South Australia.

Loc. Cape Jaffa to St. Francis Island, down to 104 fathoms.

MYADORA ROTUNDATA Sowerby.

M. tasmanica T.-Woods appears to be a synonym.

Loc. Beachport, 110 fathoms; Cape Jaffa, 130 fathoms.

MYADORA ROYANA DELICATA subsp. nov.

Fig. 10.

Shell oblong-ovate, inequivalve, thin; anterior margin sharply rounded, posterior truncate; right valve convex, sculptured with twenty irregular, narrow, slightly prominent, concentric ribs; left valve (described from paratype) flat, weakly concentrically sculptured and finely, radially striate anteriorly.

Loc. Beachport, 150 fathoms, 16·5 mm. x 10·5 mm. (type, in S. Aust. Mus., Reg. No. D. 10150); Beachport to Neptune Island, 104–300 fathoms.

Diagnosis. This deep-water subspecies appears to be the Southern representative of the *M. royana* Iredale. It is comparatively longer and the left valve is less coarsely sculptured than the left of *M. royana.*

FRENAMYA PATULA Tate *(Coelodon).*

Loc. Gulf St. Vincent to Bunbury, 8–28 fathoms.

FAMILY CLEIDOTHAERIDAE.

CLEIDOTHAERUS ALBIDUS Lamarck.

Loc. MacDonnell Bay to Rottnest Island, down to 22 fathoms.

FAMILY CLAVAGELLIDAE.

CLAVAGELLA MULTANGULARIS Tate.

The type is from Holdfast Bay. Two perfect specimens show the valves to be sculptured with well-marked concentric growth lines and numerous radii. The valves spread out widely, becoming concave marginally. A living specimen from 14 fathoms of Investigator Strait has radial and concentric sculpture which recalls that of *Petricola lapicida.*

Loc. Beachport to St. Francis Island, down to 110 fathoms.

HUMPHREYIA STRANGEI Adams and Angas.

Loc. South Australia as far west as Hardwicke Bay, down to 18 fathoms.

HUMPHREYIA INCERTA Chenu.

Loc. Gulf St. Vincent, Port Lincoln, Beachport.

FAMILY VERTICORDIIDAE.

SETALIRIS ACCESSA Iredale.

Loc. South of Cape Wiles, 100 fathoms; Cape Jaffa, 130 and 300 fathoms.

SPINOSIPELLA ERICIA Hedley *(Verticordia)*.

Loc. South of Cape Wiles, 100 fathoms; Cape Jaffa, 130 and 300 fathoms.

VERTAMBITUS TASMANICA May *(Verticordia)*.

Because of its granose sculpture this species should be located in Iredale's genus *Vertambitus*. The species appears to be very common in South Australia.

Loc. Beachport to 120 miles west of Eucla, down to 300 fathoms.

FAMILY EDENTELLINIDAE.

EDENTELLINA TYPICA Gatliff and Gabriel.

Loc. Guichen Bay and Beachport, down to 110 fathoms.

FAMILY POROMYACIDAE.

ECTORISMA GRANULATA Tate.

Loc. Beachport to 40 miles west of Eucla, down to 150 fathoms.

QUESTIMYA GRANIFERA sp. nov.

Fig. 11.

Shell oval, thin, translucent, equivalve, gaping behind; truncate posteriorly; ventral margin convex, with a slight concavity just within the posterior truncation; both dorsal margins convex; surface sculptured with very minute, numerous grains disposed radially.

Loc. 120 miles west of Eucla, 300 fathoms, 6·8 mm. x 5·3 mm. (type, in S. Aust. Mus., Reg. No. D. 10152).

Diagnosis. This Flindersian species is longer and more produced posteriorly than the Peronian *Q. undosa* Hedley.

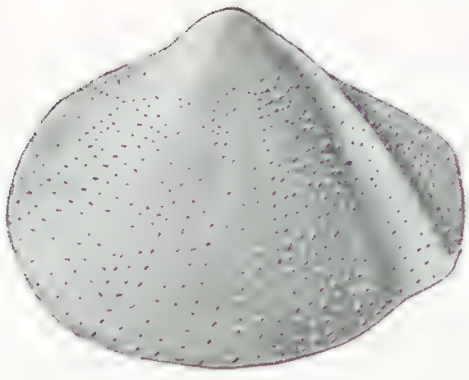

Fig. 11. *Questimya granifera* sp. nov.

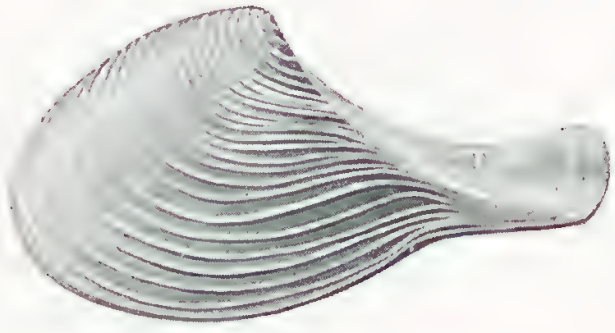

Fig 12. *Cuspidaria erma* sp. nov. (Bernard C. Cotton *del.*).

FAMILY CUSPIDARIIDAE.

CUSPIDARIA ANGASI Smith *(Naera).*

Loc. Cape Jaffa, 130 fathoms; 120 miles west of Eucla, 300 fathoms.

CUSPIDARIA DORSIRECTA Verco.

Loc. Beachport, 40 fathoms (type, in S. Aust. Mus.); Beachport to St. Francis Island, down to 150 fathoms.

CUSPIDARIA EXARATA Verco.

Loc. Thirty-five miles south-west of Neptune Island, 104 fathoms, and 90 miles west of Eucla.

CUSPIDARIA ALTA Verco.

Loc. South-west of Neptune Island, 104 fathoms (type, in S. Aust. Mus.); Beachport to Neptune Island, down to 150 fathoms.

CUSPIDARIA SIMULANS Tate *(Naera).*

Loc. Beachport to St. Francis Island, down to 150 fathoms.

CUSPIDARIA TRIGONALIS Tate.

Loc. Gulf St. Vincent to Bunbury, down to 35 fathoms.

CUSPIDARIA PINNA Verco.

Loc. Cape Jaffa, 300 fathoms (type, in S. Aust. Mus.); Cape Jaffa and 120 miles west of Eucla, down to 300 fathoms.

CUSPIDARIA ROS Verco.

Loc. Cape Jaffa, 300 fathoms (type, in S. Aust. Mus.); Cape Jaffa and 120 miles west of Eucla, down to 300 fathoms.

CUSPIDARIA ERMA sp. nov.

Fig. 12.

Ovately-pyriform, inequilateral, thin translucent, white; anterior dorsal margin rounded, posterior produced into a rostrum, then roundly truncate at the end; sculpture of twenty-four concentric ridges much narrower than the interspaces and becoming obsolete on the posterior rostrum.

Loc. Ninety miles west of Eucla, 300 fathoms, 25 mm. x 14 mm. (type, in S. Aust. Mus., Reg. No. D. 10153); 80 and 90 miles west of Eucla, 81–300 fathoms. fathoms.

Diagnosis. This species somewhat resembles *C. latesulcata* T.-Woods, but has a wider rostrum, comparatively narrower concentric ridges, and is much less solid.

CUSPIDARIA OCCIDUA sp. nov.

Fig. 13.

Ovately-pyriform, inequilateral, equivalve, thin, ventricose, white; rostrum long, compressed, gaping posteriorly; externally smooth except for fine accremental striae; a radial ridge runs from the umbo to the posterior ventral angle of the rostrum.

Loc. Forty miles west of Eucla, 72 fathoms, 6 mm. x 3·3 mm. (type, in S. Aust Mus., Reg. No. D. 10154); 40 and 80 miles west of Eucla, 72–81 fathoms; and one valve from South Australia.

Diagnosis. From *C. simulans* Tate. The present species is smooth, anterior end shorter, rostrum longer. There is a posterior radial rib.

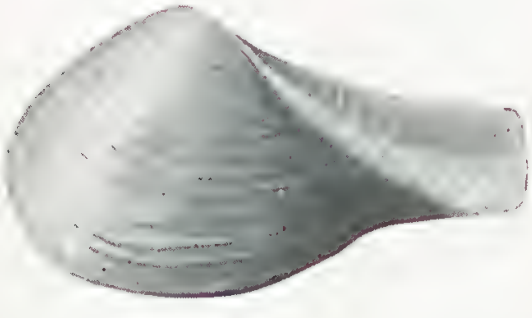

Fig. 13. *Cuspidaria occidua* sp. nov.

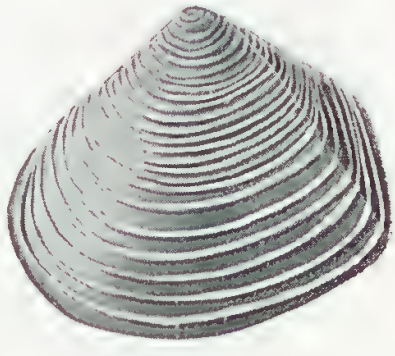

Fig. 14. *Talabrica angustior* Verco (Bernard C. Cotton *del.*).

CUSPIDARIA TASMANICA T.-Woods.

I am unable to find specimens of this species in the Museum collection from South Australia, so that it is not possible to verify its occurrence there.

FAMILY CRASSATELLITIDAE.

EUCRASSATELLA KINGICOLA Lamarck.

A careful examination of numerous South Australian specimens of *Eucrassatella* fails to reveal any which could be diagnosed as *E. kingicola sensu-strictu.* I am disposed to agree with Verco in regarding our species as *E. castanea* Reeve.

EUCRASSATELLA CASTANEA Reeve.

Although variable in shape, Flindersian specimens are constantly smoother than the Peronian *E. kingicola.*

Loc. Beachport to Fremantle, down to 100 fathoms.

SALAPUTIUM DISCUS Hedley.

Loc. Beachport to Neptune Island, down to 200 fathoms.

SALAPUTIUM PRODUCTUM Verco *(Crassatella).*

Loc. Beachport to Albany, 15–110 fathoms.

SALAPUTIUM MICRUM Verco.

Loc. Beachport to Rottnest, 15–110 fathoms.

SALAPUTIUM PROBLEEMA Verco.

Loc. Beachport to King George Sound, 12–150 fathoms.

SALAPUTIUM FULVIDA Angas.

Numerous dilapidated specimens taken in South Australian waters appear to be this species, which is an addition to the Flindersian fauna.

Loc. Beachport to Cape Borda, down to 62 fathoms.

TALABRICA CARNEA Tate *(Crassatella).*

Loc. Beachport to Gulf St. Vincent, down to 200 fathoms.

TALABRICA ANGUSTIOR Verco *(Crassatellites).*

Fig. 14.

Verco (5) introduced *Crassatellites banksii* var. *angustior,* but the variety is specifically distinct from *banksii* and *carnea.* An illustration is given here. *T. angustior* is much narrower than *T. banksii.*

Loc. North-west of Cape Borda, 55 fathoms, 18 mm. x 16 mm. (type, in S. Aust. Mus.).

(5) Verco. Trans. Roy. Soc. S. Austr., xxxi, 1907, p. 312.

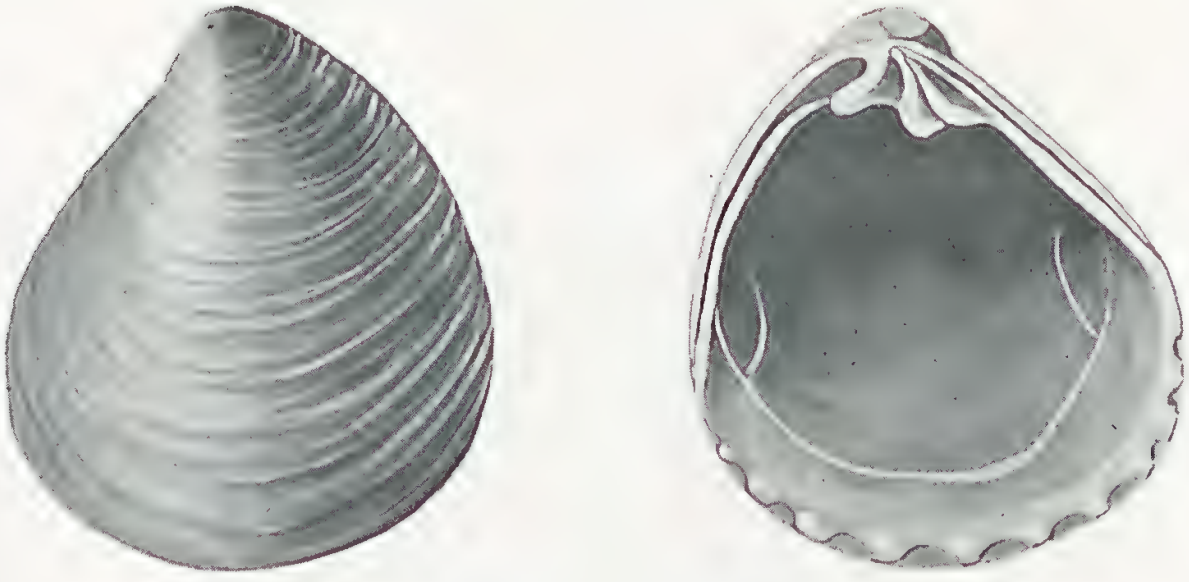

Fig. 15. *Cuna solida* sp. nov. (Bernard C. Cotton *del.*).

CUNA SOLIDA sp. nov.

Fig. 15.

Verco recorded the occurrence of *C. atkinsoni* T.-Woods in South Australian waters, noting certain differences from the typical Tasmanian form. He (6) stated the examples were too few to create a new species from them."

Forty odd specimens collected along the South Australian coast prompt me to describe the Flindersian form as a new species. Compared with typical *C. atkinsoni* it is narrower, more compressed, thicker, has fewer, less valid denticulations on the inner ventral margin, and the hinge plate and teeth are thicker. St. Francis Island appears to be the western limit of this species.

Loc. Gulf St. Vincent, 20 fathoms, 2 mm. x 2·3 mm. (type, in S. Aust. Mus., Reg. No. D. 10156); Beachport to St. Francis Island, down to 130 fathoms.

CUNA CONCENTRICA Hedley.

Loc. Cape Jaffa to St. Francis Island, down to 90 fathoms.

CUNA DELTA Tate and May *(Carditella)*.

Loc. Beachport to St. Francis Island, down to 150 fathoms.

CUNA CESSENS Verco.

Loc. Beachport to St. Francis Island, 22–150 fathoms.

CUNA EDENTATA Verco.

Loc. Cape Jaffa to Gulf St. Vincent, down to 49 fathoms.

(6) Verco. Trans. Roy. Soc. S. Austr., xxxii, p. 355, 1908.

CUNA COMMA Verco.

Loc. Backstairs Passage, 22 fathoms (type, in S. Aust. Mus.); Beachport to St. Francis Island, 20–200 fathoms.

CUNA PLANILIRATA Gatliff and Gabriel.

I did not discover this Victorian species amongst Verco's dredgings, but examination of numerous cotypes suggests that *planilirata* is wrongly located in the genus *Cuna*. I fail to see the massive cardinals characteristic of that genus. The hinge features show more affinity with *Lepton*.

HAMACUNA gen. nov.

For the peculiar species *Cuna hamata* Hedley and May the above genus is introduced. The unique, hooked, ventrally directed umbos and massive compressed hinge plate serve to distinguish this genus from *Cuna sensu-strictu*.

HAMACUNA HAMATA Hedley and May *(Cuna)*.

The variability of specimens referred to *hamata* suggests that more than one species exists in Australian waters. South Australian specimens are large and solid and vary in comparative length and height.

Loc. Beachport to Cape Borda, down to 200 fathoms.

PROPECUNA gen. nov.

This genus is introduced for the *Cuna obliquissima* Tate. The peculiar concentric grooves cutting obliquely across the accremental striae and the presence of marked posterior radial grooves serve to distinguish this and the next species from members of the genus *Cuna*.

PROPECUNA OBLIQUISSIMA Tate *(Cuna)*.

Loc. Beachport to Bunbury, down to 150 fathoms.

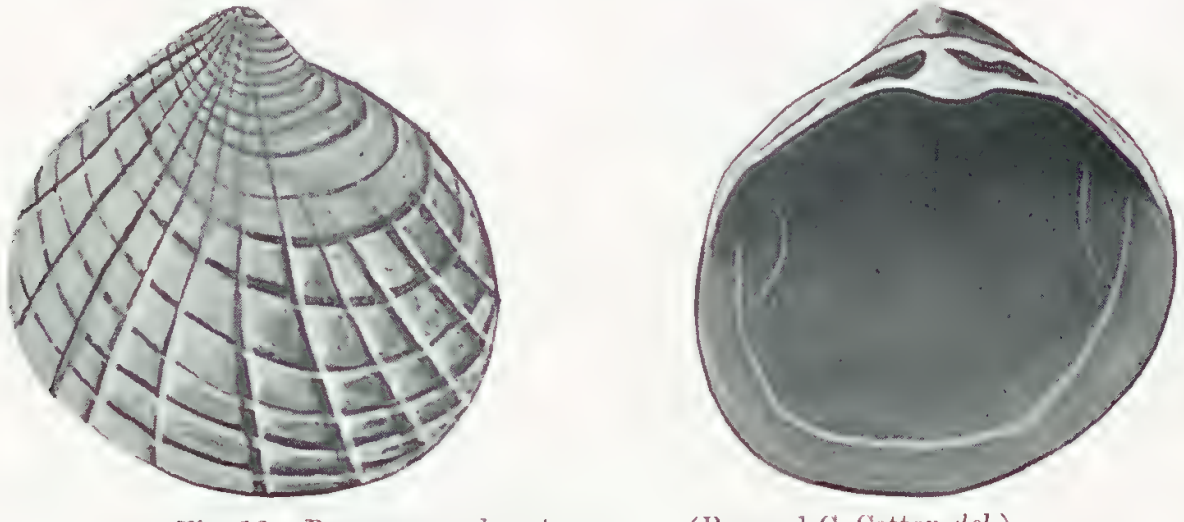

Fig. 16. *Propecuna subovata* sp. nov. (Bernard C. Cotton *del.*).

PROPECUNA SUBOVATA sp. nov.

Fig. 16.

Ovate, slightly oblique, inequilateral, solid, tinged with yellow about the umbo; sculpture of deep concentric grooves; radial grooves developed posteriorly, but only developed on the ventral half over the rest of the shell.

Loc. Beachport, 150 fathoms, 3·4 mm. x 3·3 mm. (type, in S. Aust. Mus., Reg. No. D. 10157); Beachport to 40 miles west of Eucla, down to 150 fathoms.

Diagnosis. From *P. obliquissima*. More solid, less oblique, sculpture more valid, so that the concentrics cut the radials into rectangular blocks.

FAMILY CARDITIDAE.

CARDITELLA ELEGANTULA Tate and May.

Loc. Beachport to Rottnest, down to 150 fathoms.

CARDITELLA SUBTRIGONA Tate.

Loc. Newland Head to St. Francis Island, down to 35 fathoms.

CARDITELLA VALIDA Verco.

Loc. Beachport to 40 miles west of Eucla, down to 110 fathoms.

CARDITELLA VINCENTENSIS Verco.

Loc. Newland Head to Rottnest, down to 35 fathoms.

CARDITA CRASSICOSTATA Lamarck.

Loc. Beachport to Geraldton, down to 140 fathoms.

CARDITA SQUAMIGERA Deshayes.

Loc. Backstairs Passage to 40 miles west of Eucla, down to 72 fathoms.

CARDITA INCRASSATA Sowerby.

Loc. Hopetoun to Geraldton.

CARDITA SOWERBYI Deshayes.

Fig. 17.

Deshayes (7) described this species from Swan River. No illustration was given, so a specimen from Bunbury, diagnosed by me as *sowerbyi*, is illustrated here. Size, 37 mm. x 26 mm.

Loc. Hopetoun to Fremantle, down to 35 fathoms.

(7) Deshayes. Proc. Zool. Soc., 1852, p. 103.

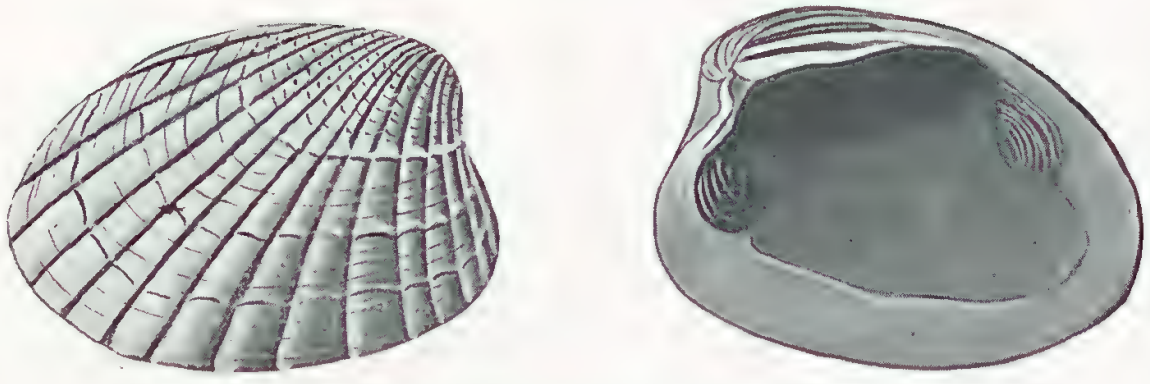

Fig. 17. *Cardita sowerbyi* Deshayes (Bernard C. Cotton *del.*).

CARDITA AVICULINA Lamarck.

Verco listed this as *C. calyculata*, a Mediterranean species. The South Australian shell is more like *C. aviculina* Lamarck, the type of which came from Shark Bay, Western Australia.

Loc. Beachport to King George Sound, down to 150 fathoms.

BATHYCARDITA RAOULI Angas *(Cardita)*.

This species occurs at Edithburgh in a subfossil state.

VENERICARDIA AMABILIS Deshayes.

Loc. Beachport to King George Sound, down to 200 fathoms.

VENERICARDIA BIMACULATA Deshayes.

Loc. Beachport to St. Francis Island, down to 150 fathoms.

VENERICARDIA ROSULENTA Tate.

Loc. Beachport to Rottnest, down to 200 fathoms.

VENERICARDIA COLUMNARIA Hedley and May.

Loc. Beachport to Newland Head, down to 200 fathoms.

VIMENTUM DILECTA Smith *(Cardita)*.

Loc. Beachport to Bunbury, down to 130 fathoms.

VIMENTUM EXCELSIOR Verco *(Cardita)*.

Verco introduced *excelsior* as a variety of *dilecta*. It is probably specifically distinct.

Loc. Beachport to Cape Borda, down to 200 fathoms.

VIMENTUM DELICATA Verco.

Loc. Beachport to 40 miles west of Eucla, down to 200 fathoms.

VIMENTUM EXULATA Smith *(Carditella)*.

Loc. Beachport to St. Francis Island, down to 130 fathoms.

FAMILY CONDYLOCARDIIDAE.

In the first part of this paper (No. 1) some new species of the genus *Condylocardia* were described. The following new species is a further addition.

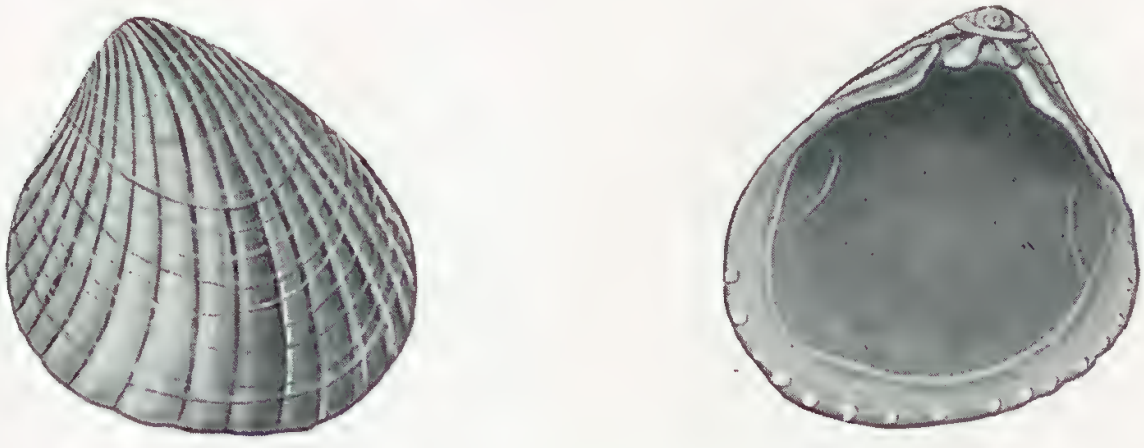

Fig. 18. *Condylocardia acuta* sp. nov. (Bernard C. Cotton *del.*).

CONDYLOCARDIA ACUTA sp. nov.

Fig. 18.

Shell trigonal, solid, acutely angled at the umbo; sculpture of eighteen rounded, depressed, radial ribs and linear interstices, crossed by concentric accremental striae; ventral margin rounded, denticulate within.

Loc. Cape Borda, 55 fathoms, 1·4 mm. x 1·6 mm. (type, in S. Aust. Mus., Reg. No. D. 10128); Kingston to Cape Borda, down to 55 fathoms.

Diagnosis. From *C. pectinata.* More solid, radial ribs fewer; umbo more acute.

FAMILY CHAMIDAE.

CHAMA RUDERALIS Lamarck.

Apparently only one species of *Chama* occurs in South Australia, according to the specimens in the South Australian Museum.

Loc. Beachport to Shark Bay, down to 100 fathoms.

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STAPHYLINIDAE *(COLEOPTERA)* FROM NEW GUINEA, IN THE SOUTH AUSTRALIAN MUSEUM

By MALCOLM CAMERON, M.B., R.N., F.E.S.

Most of the specimens here dealt with were taken by Mr. C. T. McNamara on Mount Lamington (near Buna Bay), at an elevation of from 1,300 to 1,500 feet; or at Wareo and Komba, in the Finsch Haven district, by the Rev. L. Wagner.

ELEUSII.

Eleusis diversicollis Fvl. Mount Lamington.

LEPTOCHIRI.

Priochirus (Plastus) wagneri sp. nov.

Allied to *P. monilicornis* Fvl. and *inaequalis* Bernh., but much smaller than either of these species (6·3 mm.).

Depressed, black, shining, more depressed than *monilicornis*, the thorax flatter and more transverse, with straight, parallel sides, furnished with a row of six or seven punctures, separated from the margin by a narrow smooth space; armature of the head very similar to that of *monilicornis*, but the large outer teeth are longer internally, less triangular, more spigot-shaped and more everted, the median teeth are separated from each other by a small arcuate emargination and sulcus, the left is smaller than the right; the first antennal joint is not sulcate throughout, the fourth to tenth joints transverse; the elytra are longer than the thorax, and without longitudinal impression near the lateral margin behind; abdomen with a few punctures at the base of the segments; legs black, tarsi yellow; antennae pitchy.

Finsch Haven (Rev. L. Wagner).

P. albertisi Fvl. Komba, Mount Lamington, Wareo.
P. beccarii Fvl. Mount Lamington.
P. bifurcatus Fvl. Mount Lamington.
P. novaebritaniae Bernh. Mount Lamington.
P. samoensis Blanch. Mount Lamington, Wareo.
P. spinosulis Fvl. Mount Lamington.
Borolinus minutus Cast. Beining district, New Britain.

LISPINI.

PARALISPINUS INCISUS Fvl. Mount Lamington.

LISPINUS WAGNERI sp. nov.

Moderately shining, black, the thorax sometimes reddish, elytra and apex of the abdomen yellowish-brown. Antennae and legs reddish-yellow. Length, 3 mm.

Very near *L. foveatus* Fvl., but differing in the following respects: A little narrower, the thorax less dilated in front, less abruptly narrowed behind, the disc without four quadrately placed punctures, a pair only being present, one at the apex of each median impression, the puncturation finer; elytra a little longer, yet more indistinctly punctured than in *foveatus*, and without the large puncture before the middle, but with one near the sutural margin in front and a smaller one near the sutural margin behind. The ground sculpture scarcely differs in the two species.

Finsch Haven (Rev. L. Wagner).

L. AEQUALIS Fvl. Mount Lamington.
L. CASTANEUS Fvl. Mount Lamington.
L. CURTICOLLIS Fvl. Mount Lamington.
L. FOVEATUS Fvl. Mount Lamington.
L. UNISTRIATUS Fvl. Finsch Haven.

OMALIINI.

PHLOEONOMUS (S.str.) PAPUANUS sp. nov.

Greasy-lustrous, the head and thorax reddish, elytra yellow, abdomen black, with reddish apex. Antennae and legs yellow. Length, 2 mm.

In size and build similar to *P. apicalis* Cam., but less shining, the antennae shorter and stouter, the penultimate joints much more transverse, entirely reddish-yellow, the elytra unicolourous, puncturation of the fore parts finer and closer, the thorax without trace of impressions.

Mount Lamington (C. T. McNamara).

P. CHLORIZANS Fvl. Mount Lamington.

OXYTELINI.

OXYTELUS ALBICEPS Fvl. Mount Lamington.
O. FALLAX Fvl. Finsch Haven.
O. THORACICUS (minor) Motsch. Mount Lamington.
OSORIUS CARINELLUS Fvl. Mount Lamington.

STENINI.

STENUS COELESTIS Fvl. Mount Lamington.

PROCIRRI.

PALAMINUS LIMBIFER Fvl. Mount Lamington.

P. NOVAEGUINEAE Fvl. Mount Lamington.

PAEDERINI.

PAEDERUS FEMORATUS sp. nov.

Shining; head, thorax, and elytra blue, abdomen black. Antennae with the first three and the last four joints yellow, the rest deep black. Palpi yellow, the third joint brownish. Anterior femora yellow, the extreme apex black, middle with the apical third, posterior with nearly the apical half, black; tibiae and tarsi black. Length, 13 mm.

Head a little broader than the thorax, suborbicular, the postocular region rounded and gradually retracted to the neck, the front biimpressed; punctuation rather fine, scattered, with erect, black setae. Antennae long and slender, the third joint much longer than the second, the following all much longer than broad, gradually decreasing in length. Thorax convex, ovate; with scattered punctures, coarser than on the head and with similar setae. Elytra a little shorter than the thorax, narrow at the base, and widened behind, moderately closely punctured, and with erect black setae. Abdomen longer than the fore parts, rather finely and not closely punctured, with fine, scanty pubescence and a few erect setae. Anal styles rather stout, black.

Finsch Haven (Rev. L. Wagner).

P. POLITUS Fvl. Mount Lamington.

ASTENUS MARGINALIS sp. nov.

Head, thorax, and abdomen ferruginous-red; the reflexed side margins of the thorax and the last two abdominal segments black; elytra yellow, the reflexed sides entirely, and adjacent part of the dorsal surface narrowly black. Antennae and legs pale yellow. Length, 4·75–5·50 mm.

In build resembling *A. castaneus* Cam., but with the anterior angles of the thorax completely effaced, and with coarser reticular sculpture. Antennae long and slender. Thorax at the sides with numerous long black setae. Elytra as long as, but a little broader than the thorax; with rather coarse, moderately close, asperate sculpture; the sides with long black setae. Abdomen elongate, rather finely, asperately, not closely punctured.

Mount Lamington (C. T. McNamara).

ASTENUS PAPUANUS sp. nov.

Head reddish-brown, thorax yellowish-red, on each side near the anterior angles with a small, obscure, brownish spot; elytra black, more shining, the posterior third yellow; abdomen with the first four segments red, the first and second more or less infuscate at the base, or reddish-brown, with the posterior margin lighter, the fifth entirely black, the sixth black, with the posterior border yellowish. Antennae yellow. Legs pale yellow. Length, 4 mm.

In size and build much resembling *A. bimaculatus* Er., but differently coloured, the eyes larger, temples shorter, anterior angles of the thorax less rounded, elytra broader, and antennae longer and more slender. The head and thorax have the usual umbilicate sculpture, the latter with four black setae on each side. Elytra closely and asperately punctured, without lateral setae. Abdomen with the first four segments closely and asperately punctured, the fifth much more finely and sparingly.

Mount Lamington (C. T. McNamara).

A. BICINCTUS Fvl. Mount Lamington.

MEDON PAPUANUS sp. nov.

Moderately shining, black, the elytra castaneous, more or less broadly infuscate on the disc; abdomen with the posterior margin of the last two segments yellow. Antennae and legs red. Length, 6·2 mm.

Build of *M. luctuosus* Fvl., but more robust and more shining, the elytra differently coloured, head larger, more coarsely sculptured, scarcely strigose; thorax much more coarsely sculptured, with broad, smooth, median line; elytra a little longer, much more coarsely punctured, abdomen much less finely and much less closely punctured. Head a little transverse, subquadrate, longer and a little broader than the thorax, eyes small, temples long, the posterior angles briefly rounded, the base deeply emarginate, the vertex with a small smooth space, elsewhere with umbilicate punctures, the interspaces narrow, with tendencies to coalesce longitudinally. Antennae moderate, the third to seventh joints longer than broad, gradually decreasing in length, the eighth to tenth moniliform. Thorax transverse, trapezoidal, smooth along the middle, elsewhere with close, unbilicate punctures. Elytra longer and a little broader than the thorax; closely and moderately coarsely punctured. Abdomen moderately finely and moderately closely punctured.

Finsch Haven (Rev. L. Wagner).

M. CINCTUS Fvl. Wareo, from nest of ants (*Cremastogaster* sp.).

M. CURTUS Kr. Mount Lamington.

M. GIGANTEUS Fvl. Mount Lamington.

LITHOCHARIS VILIS Kr. Finsch Haven, Mount Lamington.

STILICUS HIEROGLYPHICUS Fvl. Mount Lamington.

XANTHOLININI.

LEPTACINUS FLAVIPENNIS Kr. Mount Lamington.

PACHYCORYNUS DIMIDIATUS Motsch. Mount Lamington.

DINOXANTHOLINUS CAERULEIPENNIS sp. nov.

Shining; head, thorax, scutellum, and abdomen black; elytra bright blue, greenish at the base and humeral angles. Antennae blackish, the first two joints reddish-brown, the apex of the eleventh yellowish. Palpi reddish. Legs reddish-brown. Length, 23 mm.

Differs from *D. prodigiosus* Heller in the narrower build, shorter antennae, and differently coloured elytra. Male. Head transverse, subquadrate, broader than the thorax, the eyes about as long as the temples, the posterior angles rounded; between the eyes with four foveae placed transversely, the central pair larger than the lateral, and produced forwards as a small sulcus towards the antennal tubercle on each side; behind and internal to the eye with two large, adjacent punctures, along the base with a few others, the temples closely and rugosely punctured. In the female the head is smaller, the temples extremely finely and sparingly punctured. Mandibles long and slender, the right at some distance behind the apex with a sharp tooth, the left with a tooth with two sharp cusps; outer surface not sulcate. Antennae with the first joint elongate, second short, about half as long as the third, fourth scarcely, fifth to tenth strongly transverse, eleventh conical. Thorax longer than broad, widest at the obtuse anterior angles; with a large single puncture near these, the side margins with a few punctures. Scutellum impressed at apex, and with four or five punctures, finely transversely strigose. Elytra as long as and a little wider than the thorax, along the suture with a row of five or six large punctures, and a subhumeral row of six or seven others, externally at the reflexed margin with four or five small punctures, and on the reflexed margin itself with trace of another row; posterior margin closely striate. Abdomen closely punctured at the base of the segments, elsewhere more finely and much more sparingly, the sides and apex with some long yellow setae.

Mount Lamington (C. T. McNamara).

DINOXANTHOLINUS LATERALIS sp. nov.

♀ Differs from the female of the preceding species as follows: The size is smaller (17 mm.), the elytra brilliant bluish-green, the base and humeral angles

golden-coppery, the reflexed margin of the elytra is closely and rugosely punctured, and of a brilliant coppery-red almost to the posterior angle; in other respects similar.

Fak Fak. A single specimen in my collection.

D. PRODIGIOSUS Heller. Finsch Haven.

THYREOCEPHALUS ALBERTISI Fvl. Mount Lamington, Wareo.

T. AUREUS Bernh., var. Mount Lamington.

T. GIGANTULUS Bernh. Mount Lamington.

T. TAITIENSIS Boh. Mount Lamington, Wareo.

DIOCHUS INDICUS Kr. Mount Lamington.

STAPHYLININI.

HESPERUS VIVIDUS sp. nov.

Brilliant; head and thorax varying from green to golden-green, the elytra blue, on each near the suture with a broad, longitudinal, purple fascia, not reaching the apical margin, middle of the base sometimes purple; scutellum black; abdomen, mesosternum, and metasternum red, the last segment of the former blackish. Thorax with dorsal series of four punctures. Antennae with the first three joints red, the last two or three yellow, the rest black. Palpi and legs (including the coxae) reddish-testaceous. Length, 13–14 mm.

Var. Elytra bluish-green, the suture greenish-coppery.

Build of *Philonthus gestroi* Fvl., but differing in colour. Head suborbicular, as broad as the thorax, the eyes large and rather prominent, the postocular region about half as long; adjacent to the inner side of the eye in front with a single puncture, postero-internally to it with a group of five or six irregular punctures, and a few along the base; besides these larger punctures there are some fine scattered ones. Antennae reaching the base of the elytra, the third joint twice as long as the second, fourth to seventh longer than broad, gradually decreasing in length, eighth to tenth about as long as broad. Thorax with the sides nearly straight, slightly retracted behind; on each side of the middle with a row of four fine punctures, the second of the series further from the third than this is from the fourth, externally with a row of five larger punctures; besides these there are a few extremely fine scattered ones. Scutellum closely punctured. Elytra as long as but broader than the thorax, closely, moderately finely punctured, with fine grey pubescence. Abdomen narrowed behind, finely and very sparingly punctured, somewhat less sparingly behind; pubescence sparing and with a few semi-erect setae.

♂ Anterior tarsi dilated; sixth ventral segment with a semi-elliptical excision.

Mount Lamington (C. T. McNamara).

HESPERUS EXCELSUS sp. nov.

Shining; head, thorax, scutellum, and abdomen very black, elytra green, with broad, indeterminate, transverse blue fascia; antennae black, the last three joints pale yellow; palpi pitchy. Legs pale yellow, the coxae and apices of the femora and tibiae black, tarsi black. Thorax with dorsal series of four punctures. Length, 9·3 mm.

In build somewhat resembling *Philonthus rufithorax* Fvl. Head orbicular, as broad as the thorax, the postocular region a little longer than the eye, the front sulcate; adjacent to each eye with a single intraocular puncture, postero-internal to the eye with a group of three punctures, along the base with a row of six or seven others. Antennae reaching the base of the elytra, the third joint a little longer than the second, fourth to sixth a little longer than broad, gradually decreasing in length, seventh to tenth slightly transverse. Thorax with the sides straight, very slightly retracted behind, with dorsal row of four punctures, the second of the series further from the third than the latter from the fourth, externally near the anterior angles with three others. Scutellum closely punctured. Elytra as long as but broader than the thorax; moderately finely and rather sparingly punctured; with sparing, rather long pubescence, and erect black setae. Abdomen narrowed behind, the first three segments with basal and apical row of fine punctures, elsewhere very sparingly punctured, the last three segments sparingly and irregularly punctured, and with some erect, black setae. Anterior tarsi dilated in both sexes.

♂ Sixth ventral segment with small arcuate excision.

Mount Lamington (C. T. McNamara).

PHILONTHUS BICOLORATUS sp. nov.

Shining; head black, with greenish reflex in certain lights; thorax bright red, with similar reflex, dorsal row of five punctures; elytra black, the suture and posterior margin very narrowly reddish; abdomen entirely red, slightly iridescent. Antennae with the first two joints and base of the third red, the ninth reddish, the tenth and eleventh pale yellow. The rest black. Legs reddish-yellow. Length, 7·5 mm.

In build very similar to *P. productus* Kr., but differently coloured, the thoracic punctures smaller, the abdomen more finely and more sparingly punctured. Head quadrate, as broad as the thorax, the posterior angles rounded; the eye about as long as the temple; the middle of the front foveate; the median intraocular punctures more distant from each other than from the lateral, between the posterior margin of the eye and the neck with two punctures placed obliquely, two others close to the posterior margin of the eye, and a third a little

behind them; ground sculpture fine, transverse. Antennae reaching a little beyond the base of the elytra, the third joint longer than the second, fourth to seventh a little longer than broad, gradually decreasing in length, eighth to tenth slightly transverse. Thorax as long as broad, widest in front at the briefly rounded anterior angles, the sides almost straight and slightly retracted to the broadly rounded posterior angles, setiferous, dorsal punctures moderate, externally with three others in a curved row, ground sculpture as on the head. Scutellum rather coarsely punctured. Elytra as long as the thorax, the sides with several long black setae, moderately coarsely and moderately closely punctured. Abdomen rather finely, moderately closely punctured, pubescence rather coarse, not very close, the sides setiferous.

♂ Head larger, anterior tarsi moderately dilated; sixth ventral segment triangularly impressed behind in the middle, the base of the impression rather deeply triangularly emarginate.

Finsch Haven (Rev. L. Wagner).

PHILONTHUS PAPUANUS sp. nov.

Black, head and thorax shining, elytra and abdomen duller, densely and finely punctured. Thorax with dorsal row of five punctures. Antennae black, the first and eleventh joints yellow. Legs yellow, anterior coxae pitchy. Length, 5·75–6·00 mm.

Very similar to *P. flavipes* Kr., in build, colour, and antennal structure, but with smaller head, scarcely metallic, much more finely and densely punctured elytra and abdomen. Head in both sexes suborbicular, narrower than the thorax, the eyes larger than in *flavipes*, not prominent, longer than the postocular region; median intraocular punctures widely separated; antennae reaching the base of the elytra, the penultimate joints about as long as broad. Thorax with straight sides, slightly retracted in front. Scutellum densely punctured. Elytra as long as the thorax, very finely and very closely punctured and pubescent. Abdomen very finely and densely punctured and pubescent throughout.

♂ Anterior tarsi dilated, sixth ventral segment with acute triangular excision.

Mount Lamington (C. T. McNamara).

PHILONTHUS MCNAMARAE sp. nov.

Entirely black, elytra and abdomen less shining; thorax with dorsal row of six punctures. Antennae yellowish-red, the fourth to seventh or ninth joints blackish; legs yellow, femora pitchy. Length, 7 mm.

Near *P. rectangulus* Sharp, but differing in the shorter, differently coloured antennae, more suborbicular head, which is as broad as the thorax in the male,

slightly narrower in the female, smaller eyes, shorter thorax, the sides slightly emarginate behind the anterior angles, more finely punctured elytra and abdomen. The antennae are short, scarcely reaching the base of the thorax, the fourth joint square, the fifth to tenth distinctly transverse; ground sculpture on the head and thorax well marked, but without sericeous reflex. From *P. ventralis* Gr. it is distinguished by the more robust build, larger head, shorter, differently coloured antennae, and shorter, broader thorax. The anterior tarsi are strongly dilated in both sexes.

♂ Sixth ventral segment acutely triangularly impressed, the base of the impression slightly, arcuately emarginate.

Mount Lamington (C. T. McNamara); Finsch Haven (Rev. L. Wagner).

P. BECCARII Fvl. Finsch Haven.
P. HUMERALIS Fvl. Mount Lamington, Wareo.
P. MINUTUS Boh. Mount Lamington, Wareo.
P. OREOPHILUS, Fvl. Mount Lamington.
P. PILIPENNIS Macl. Mount Lamington.
P. RALUMENSIS Bernh. Finsch Haven.
P. RUFITHORAX Fvl. Wareo.
P. SERICEICOLLIS Fvl. Mount Lamington, Wareo.
P. THERMARUM Aube. Mount Lamington.
BELONUCHUS FUSCIPES Fvl. Mount Lamington.
B. LIVIDIPES Fvl. Wareo.
LEUCITUS ARGYREUS Fvl. Madang, Wareo.
L. BECCARII Fvl. Finsch Haven.
MYSOLIUS AURICHALCEUS Fvl. Wareo.
ACTINUS IMPERIALIS Fvl. Madang, Mount Lamington, Wareo.

QUEDIINI.

QUEDIUS CYANEORUFUS Fvl. Mount Lamington.
Q. SPLENDIDUS Fvl. Finsch Haven.

TACHYPORINI.

TACHINOMORPHUS ALUTACEUS Fvl. Finsch Haven, Mount Lamington.
T. CYANIPENNIS Bernh. Mount Lamington, Wareo.

COPROPORUS PAPUANUS sp. nov.

Convex, narrowed behind, black, shining, the sides and base of the thorax, the sides and apical margin of the elytra narrowly and indeterminately reddish; abdomen with the posterior margins of the segments rufescent. Antennae with

the first five or six joints pale yellow, the rest infuscate. Legs yellow. Length, 2 mm.

Build of *C. dimidiatus* Fvl., but narrower and a little smaller, differently coloured, the colour and structure of the antennae and the sculpture scarcely differing. Head extremely finely punctured and without ground sculpture. Antennae with the third joint elongate, as long as the second, fourth to sixth distinctly longer than broad, gradually decreasing in length, seventh about as long as broad, eighth to tenth transverse. Thorax extremely finely and obsoletely, scarcely perceptibly but rather closely punctured, without ground sculpture; elytra a little longer than the thorax, extremely finely but more distinctly punctured than the thorax, with, in certain lights, a fine transverse striation. Abdomen extremely finely and moderately closely punctured, without ground sculpture.

Mount Lamington (C. T. McNamara).

C. ALUTACEUS Fvl. Mount Lamington.
C. ASPER Fvl. Mount Lamington.
C. BASICORNIS Fvl. Mount Lamington.
C. CURTICORNIS Fvl. Mount Lamington.
C. DIMIDIATUS Fvl. Mount Lamington.
C. MELANARIUS Er. Mount Lamington.
C. PAPUANUS Fvl. Mount Lamington.

AUSTRALASIAN COLEOPTERA

By ARTHUR M. LEA, F.E.S., Entomologist, South Australian Museum.

Figs. 1-2.

Family STAPHYLINIDAE.

The New Guinea Staphylinidae, here dealt with, are all described from single specimens that were sent to Dr. Cameron, and returned by him as new; some other species were also returned by him as new, but as they are inconspicuous or too closely related to others, it was undesirable to name them.

Oxytelus oblongifer sp. nov.

♀ Black, muzzle, basal joint of antennae, palpi, base of elytra, tips of abdominal segments, sterna, and legs testaceous-brown.

Head not very large, base with a semi-circular impression; antennary ridges rather long and well defined, between them a transverse oblong space, bounded by distinct impressions; with crowded and rather small but sharply defined punctures. Antennae with seventh-tenth joints transverse. Prothorax at apex almost twice as wide as long, sides feebly decreasing in width to base; with crowded punctures, slightly larger than on head, and with several shallow depressions, but without well defined longitudinal ones. Elytra moderately transverse, at base slightly wider than apex of prothorax; with punctures about the same size but less crowded. Abdomen very minutely punctate or shagreened. Legs rather thin. Length, 4·5 mm.

New Guinea: Finsch Haven (Rev. L. Wagner).

To a certain extent approaching *O. wattsensis* (from Victoria) but interocular impressions different, and prothorax with less defined longitudinal impressions and coarser punctures. There is an obscurely pale space at the base of the elytra, which is fairly distinct at the shoulders, and is dilated to the suture at the basal third, but becomes very ill defined towards it. The oblong space on the front of the head from some directions appears shining and with very small punctures, but from others appears subopaque and with fairly well defined ones. The abdomen has a somewhat leathery appearance.

Osorius strigiceps sp. nov.

Black, shining, elytra and abdomen not quite as black as head and prothorax, legs and palpi reddish-brown, antennae slightly darker. Clothed with short,

brown, sloping setae, becoming longer and paler on abdomen, especially at apex.

Head closely longitudinally strigose, except at base, which is smooth and shining. Basal joint of antennae as long as four following combined, sixth to tenth distinctly wider than the others and transverse. Prothorax slightly wider than head, slightly longer than the basal width, but less than the apical width, parallel-sided to basal third, and then oblique to base; with crowded and sharply defined but not very large punctures, leaving a narrow, polished median line. Elytra about as long as wide, the width of apex of prothorax, a narrowly impressed line on each side of suture; with rugose punctures somewhat sparser and smaller than on prothorax. Abdomen cylindrical, punctures rather small, fourth and fifth segments the width of elytra. Front and middle tibiae strongly pectinated externally. Length, 5 mm.

New Guinea: Finsch Haven (Rev. L. Wagner).

Allied to *O. carinellus*, but smaller and thinner, and elytra with denser and smaller but more sharply defined punctures.

STENUS CRIBRICOLLIS sp. nov.

Purplish-blue, antennae light brown, the four apical joints almost white, legs flavous, knees slightly infuscated. Under surface with fine silvery pubescence, upper surface of abdomen sparsely pubescent, rest of upper surface glabrous.

Head wide, interocular space depressed, and with sparse and small, but sharply defined punctures. Eyes about half the length of prothorax. Antennae long and thin, passing base of elytra, third joint longest of all, ninth and tenth wider than the others and, with the eleventh, forming a loose club. Prothorax subcylindrical, almost twice as long as wide; with crowded and rather small but sharply defined punctures. Elytra much wider and slightly longer than prothorax, and with larger but equally crowded punctures. Abdomen about half the total length, second to fourth segments strongly constricted and with fairly large punctures towards base, fifth and sixth longer and with smaller punctures than the preceding ones, fourth with an acute ridge on the under surface, ending in a sharp tooth. Legs long and thin. Length, 9 mm.

New Guinea: Hudewa (Rev. L. Wagner).

Allied to *S. coelestis* and *caeruleus*, but larger, antennae not uniformly coloured, prothorax longer and with denser and finer punctures (fully twice as dense), and elytral punctures denser. The palpi and one antenna are missing from the type, which appears to be a male.

OEDICHIRUS PYRICOLLIS sp. nov.

Brownish-black, shining, antennae palpi and legs flavous. Glabrous, except for a few hairs at sides.

Head deeply constricted at base, with a narrow neck; with numerous large, sharply defined punctures. Antennae thin, slightly passing base of prothorax, first joint slightly longer than second and third combined, fifth to tenth feebly decreasing in length. Prothorax wider than head and much longer, sides rounded in front, and strongly narrowed to base, which is about half as wide as the greatest width; punctures about as large as on head but sparser, and with an impunctate median space. Elytra small, base narrow, greatest width (near apex) about equal to that of prothorax, punctures much as on head. Abdomen about half the total length, with punctures as on elytra, but becoming longitudinal at the base of each segment, fifth and sixth with sparser punctures than the others; anal styles almost the length of elytra. Legs long and thin. Length, 7 mm.

Papua: Mount Lamington (C. T. McNamara).

An apterous species, in general appearance like *O. cribricollis*, on a greatly reduced scale, but also very sparsely clothed. *O. grandis* and *cribripennis* are about the same size, but have more numerous setae, and the legs are partly black. Four of the abdominal segments are extended, exposing the thin connecting membranes, which are of a flavous colour.

OEDICHIRUS CRIBRIPENNIS nom. nov.

O. geniculatus Lea, nom. pr.

I have to thank Mr. C. Oke for calling my attention to the fact that the name *geniculatus* was previously used (1847) in this genus for a Brazilian species. As a substitute I propose the name *cribripennis* for the Australian species.

PAEDERUS MICROPTERUS sp. nov.

Black and pale castaneous-brown, three apical joints of antennae flavous. Clothed with rather long and sparse, blackish hairs.

Head slightly longer than wide, widest across eyes; with sparse piliferous punctures. Antennae thin, extending to tips of elytra, first joint slightly longer than third, and more than twice the length of second, fourth-tenth subequal. Prothorax slightly longer than head, and distinctly thinner, sides evenly rounded and scarcely wider at apex than at base; with sparse and small piliferous punctures. Elytra small, slightly shorter than prothorax, and evenly dilated to apex, which is about the width of the middle of prothorax, surface shagreened and with fairly large punctures. Abdomen about half the total length, greatest width equal to that of head; with a few scattered punctures; anal styles slightly shorter than elytra. Legs long and thin. Length, 13 mm.

Papua: Mount Lamington (C. T. McNamara).

An apterous species, structurally close to *P. femoratus*, but very differently coloured. The black parts are the head, prothorax, anal styles, third to eighth joints of antennae, tibiae and apex of femora.

MEDON INCONSPICUUS sp. nov.

Blackish-brown and somewhat shining, head black, muzzle, antennae and legs dull brown. Closely covered with minute pubescence, and with sparse hairs on the sides, becoming longer, darker, and more numerous at the apex of abdomen.

Head (excluding parts in front of eyes) slightly transverse, hind angles rounded off; with dense and minute punctures. Antennae slightly passing base of prothorax, first joint as long as the three following combined, fourth as long as wide, slightly shorter than third, the others feebly decreasing in length till the tenth is moderately transverse. Prothorax the width of head, and with similar punctures, about as long as wide, angles rounded off. Elytra quadrate, slightly wider and longer than prothorax, and with slightly stronger punctures. Abdomen about half the total length, across middle the width of elytra. Legs rather thin. Length, 4·5 mm.

New Guinea: Finsch Haven (Rev. L. Wagner).

In general appearance like *M. curtus* on a reduced size, but narrower, punctures less sharply defined, and antennae and legs longer; structurally it is close to *M. leai* (from the Malay Peninsula), but is slightly thinner, less opaque, shoulders not pale, and legs darker; from *M. lindi* (from Australia), it differs in having a slightly larger head, with stouter antennae, shorter prothorax, and distinctly shorter head, its colours are practically identical with those of that species; structurally it is also close to *L. ochraceus*, but is considerably darker.

MEDON PICTUS sp. nov.

Red, elytra dark brown, apical two-fifths flavous, abdomen with fourth and part of fifth segment as dark as base of prothorax, basal segments slightly paler, the apex still paler; legs flavous, mandibles, palpi and antennae slightly redder. With minute pale pubescence, more distinct on elytra and abdomen than elsewhere, apex of abdomen with short and fairly numerous setae.

Head subquadrate behind antennae, hind angles slightly rounded; with fairly dense and sharply defined but small punctures. Antennae not extending to base of prothorax, fourth to tenth joints transverse. Prothorax the width of head and slightly shorter, sides feebly decreasing in width to near base, where they are strongly rounded off; with punctures as on head, except on a slightly elevated median line. Elytra the width of head and fully its length (including the jaws), feebly impressed on each side of suture; punctures slightly coarser than on head. Abdomen less than half the total length, fourth and fifth segments the width of

elytra, the others narrower; punctures smaller than on head. Legs not very long. Length, 3·5 mm.

Papua: Mount Lamington (C. T. McNamara).

Approaching *M. cinctus* and *fasciatus*, but wider, less shining, black part of elytra basal instead of subapical, and with denser and stronger punctures.

CHARICHIRUS LINEIFER sp. nov.

Blackish, subopaque, muzzle, antennae, palpi, apical fourth of elytra, tip of abdomen and legs testaceous-brown. Minutely pubescent all over, and with a few hairs at sides, becoming fairly numerous at apex of abdomen.

Head strongly narrowed in front, parellel-sided behind eyes, hind angles rounded off, base feebly bilobed. Antennae distinctly passing base of prothorax, first joint almost as long as second and third combined, third longer than second, the others gradually decreasing in length to tenth, which is feebly transverse. Prothorax slightly transverse, apex about the width of head, sides feebly decreasing in width to base, with a shining, narrow, complete median line. Elytra slightly longer than wide, sides feebly increasing in width posteriorly; with dense and minute punctures. Four basal segments of abdomen parallel-sided, the following ones narrowed. Legs moderately long. Length, 6 mm.

New Guinea: Finsch Haven (Rev. L. Wagner).

Fairly close to *C. chinensis*, but somewhat narrower, median carina of pronotum more defined, and less of apical portion of elytra pale. The elytral punctures are very dense and minute, but can be distinguished with a strong lens; on the rest of the upper surface the punctures are still finer, so that the surface might fairly be regarded as shagreened.

METOPONCUS APICIVENTRIS sp. nov.

Head, basal two-thirds of third segment of abdomen, fourth (except the tip) and all the following ones black, elytra deep purple; prothorax (apical half deeply infuscated), antennae, palpi, and legs more or less reddish, two basal segments of abdomen and parts of the two following ones reddish-flavous. With a few dark hairs at sides, but conspicuously longer and fairly numerous ones at tip of abdomen.

Head almost twice as long as wide, with an oblique groove close to the inner side of each eye, a double projection between the antennae, sloping downwards in front; punctures sparse and minute. Antennae short, most of the joints transverse, first as long as three following combined. Prothorax distinctly longer than wide, shorter than head, the apex almost as wide, sides feebly diminishing in width to base; with a few distinct punctures. Elytra about as long and as wide as

prothorax, impunctate. Abdomen about half the total length, six basal segments parallel-sided and with elevated margins, the following ones narrower and not margined. Femora and tibiae short, tarsi thin. Length, 7 mm.

Papua: Mount Lamington (C. T. McNamara).

Structurally fairly close to *M. semiruber* (from Fiji), but slightly narrower, head black, and red segments of abdomen differently placed. *M. hoplocephalus* (also from Fiji), has the head read and abdomen entirely black. The elytra at first glance appear to be shining black.

PHILONTHUS INTERANTENNALIS sp. nov.

Head and parts of abdomen black, prothorax castaneous, a large blackish blotch occupying the apical two-thirds, but not extending to sides or extreme apex; elytra, tips and margins of four basal segments of abdomen, more than half of fifth, all sixth, and the legs castaneous; muzzle, jaws, palpi and scutellum darker; basal joint of antennae brownish-castaneous, second to ninth blackish, tenth and eleventh brownish-flavous. With rather sparse black hairs, mostly on the sides, but becoming numerous at apex of abdomen, elytra with stiff, pale pubescence or short setae.

Head subquadrate, but angles rounded off, with large punctures scattered about posteriorly and near the eyes, but one immediately behind each antenna; a small fovea half-way between the antennae. Eyes about as long as basal joint of antennae. Antennae slightly passing base of prothorax, first joint almost as long as second and third combined, these subequal, the following ones gradually decreasing in length, seventh-tenth transverse. Prothorax scarcely narrower than head, slightly longer than wide, front angles feebly rounded off, sides parallel to base, which is evenly rounded; with a few large punctures scattered about, and four forming a row on each side of middle. Elytra slightly wider and longer than prothorax, feebly dilated posteriorly; with small and not very dense, but sharply defined punctures. Abdomen slightly wider in middle than elsewhere, each of four basal segments with an apical row of setiferous punctures, and irregular ones elsewhere. Legs rather short. Length, 8 mm.

New Guinea: Finsch Haven (Rev. L. Wagner).

The outlines are somewhat as on *P. mcnamarae*, but the prothorax and elytra are differently coloured, and the elytral punctures are very different.

On each side of the apex of the sixth segment of the abdomen of the type, and exterior to the anal styles, there is a white style-like process, slightly longer than the styles, and without hairs. They are possibly parasites that were killed at the time of capture.

PHILONTHUS CASTANEICOLLIS sp. nov.

Most of the head shining black, prothorax bright castaneous, parts of elytra, of abdomen and legs dull flavo-castaneous, muzzle darker, antennae with two basal joints somewhat castaneous, the five following ones blackish; the others paler, with the tenth and eleventh brownish-flavous.

Head moderately convex, hind angles rounded off; with fairly large punctures towards base and about eyes, a conspicuous one behind each antenna, and a median fovea between them. Antennae slightly passing base of prothorax, first joint almost as long as second and third combined, third slightly longer than second, the others to tenth gradually decreasing in length, till the ninth and tenth are transverse. Prothorax about as long as wide, sides almost parallel, front angles almost square, the hind ones strongly rounded; with a row of four distinct punctures on each side of middle, a row of two towards each side, and a few elsewhere. Elytra transverse, at base wider than prothorax, sides slightly dilated posteriorly; with rather small and sparse, but sharply defined punctures. Four basal segments of abdomen almost parallel-sided; with small setiferous punctures, mostly in transverse rows; anal styles rather long. Legs moderately long. Length, 7 mm.

New Guinea: Finsch Haven (Rev. L. Wagner).

The middle joints of the antennae are distinctly darker than the basal and apical ones, but the eleventh is not much paler than the first. The apical third of the elytra (but not the margins) is deeply infuscated, almost black, the scutellum, metasternum, and parts of four basal segments of abdomen are deeply infuscated, but parts of the abdomen have a bluish iridescence; the anal styles are no darker than the two apical segments. The interantennary fovea is smaller than on the preceding species, and not quite as close to the clypeus, on that species it is almost in contact with it.

PHILONTHUS PAUPER sp. nov.

Black, shining, tip of each abdominal segment, and legs (the femora paler) testaceo-flavous, antennae blackish-brown, first and eleventh joints paler. With a few black hairs at sides, becoming numerous at tip of abdomen; elytra with dark pubescence.

Head rather small and convex; with a few large punctures towards base and near eyes, a distinct one behind each antenna. Antennae slightly passing base of prothorax, first joint almost as long as second and third combined, sixth to tenth slightly transverse. Prothorax slightly longer than wide, and slightly wider than head, front angles square, sides feebly dilated to beyond the middle, base widely rounded; with a few scattered punctures, and four forming a row on each side

of middle. Elytra slightly transverse, sides feebly dilated posteriorly; with rather small and not very sharply defined punctures. Abdomen parallel-sided to beyond the middle, with small punctures, anal styles rather long. Legs moderately long. Length, 5 mm.

Papua: Mount Lamington (C. T. McNamara).

Allied to *P. oreophilus*, but prothorax black, tibiae paler, and elytral punctures much less sharply defined. The colours are somewhat as on the widely distributed *P. nigritulus*, but the prothorax is distinctly wider and the head is shorter. The muzzle and palpi are not black, but obscurely piceous; parts of the abdomen are somewhat iridescent. The type appears to be a female.

HESPERUS QUINQUECOLOR sp. nov.

Head, antennae (three apical joints whitish), scutellum and abdomen black; prothorax, sterna and legs bright castaneous; jaws and palpi darker, elytra bright purple, becoming bluish at suture. With some long black hairs scattered about, elytra with rather long pubescence, becoming sparser on prothorax.

Head moderately convex, base almost semicircular; with rather sparse punctures, becoming very sparse in front. Eyes about one-third the length of prothorax. Antennae passing base of prothorax, third joint distinctly shorter than first, and much longer than second or fourth, the others gradually decreasing in length to tenth, which is feebly transverse. Prothorax longer than wide, apex the width of head, sides decreasing in width to base, which is rounded off; with sparse and minute punctures. Elytra much wider than prothorax, impressed on each side of suture; with fairly dense, small punctures. Abdomen about half total length, first and second segments with a narrow line at base, third and fourth with irregular punctures there, a fine row at apex and irregular ones elsewhere, fifth and sixth with larger and irregular piliferous punctures; anal styles conspicuous. Legs long. Length, 10 mm.

New Guinea: Wareo (Rev. L. Wagner).

A beautiful species, approaching *H. rufithorax*, but abdomen black, and antennae stouter.

HESPERUS GAGATIVENTRIS sp. nov.

Bright reddish-castaneous, fourth-ninth joints of antennae black, eleventh dull pale brown, tenth intermediate in colour, scutellum, metasternum and abdomen black, elytra bronzy-purple, becoming purple at sides and apex. With sparse long hairs on sides of upper surface, becoming numerous at apex of abdomen, elytra sparsely pubescent.

Head with hind angles strongly rounded off; with a few scattered punctures, including three near each eye and two close together in front of middle. Antennae not extending to base of prothorax, first joint as long as second and third combined, these subequal, fourth and fifth subglobular, sixth-tenth transverse, and subequal. Prothorax slightly longer than wide, front angles almost square, sides gently decreasing in width to base, hind angles strongly rounded off; with a row of three strong punctures on each side of middle. Elytra moderately transverse, much wider than prothorax, each separately rounded at apex, the sides gently rounded; with sharply defined, rather small, and not very dense punctures. Abdomen half total length, fifth segment longest of all; with small punctures, mostly in transverse series. Legs moderately long. Length, 7 mm.

Papua: Mount Lamington (C. T. McNamara).

Another beautiful species, with prothorax and elytra somewhat as on *H. rufithorax*, but head and abdomen different. The abdomen is of a polished black, with sharply defined punctures.

HESPERUS BIFUSCIPENNIS sp. nov.

Bright pale castaneous, head (muzzle excepted) and prothorax deep metallic blue, a large infuscate blotch on each elytron near suture, anal styles black, fourth to eighth joints of antennae blackish, the following ones flavous. Upper surface with a few dark hairs; elytra with yellowish pubescence, becoming sparser and shorter on under surface.

Head rather large, hind angles rounded off; with sparse and minute punctures, and a few large ones about base and sides of eyes. Eyes about half the length of prothorax. Antennae slightly passing scutellum, third joint much shorter than first, longer than second and still longer than fourth, sixth-tenth slightly decreasing in length and increasing in width. Prothorax distinctly longer than wide, front angles rectangular, sides parallel for a short distance and then decreasing in width to base, which is gently rounded; with minute punctures and a few large ones scattered about, and a row of three distinct ones on each side of middle. Elytra transverse, distinctly wider than head, sides feebly dilated to apex; with fairly dense and rather small, asperate punctures, having a granulate appearance. Abdomen gently decreasing in width to apex; with small setiferous punctures, mostly in transverse series. Legs moderately long. Length, 12 mm.

Papua: Mount Lamington (C. T. McNamara).

Allied to *H. gratiosus*, but head and prothorax blue, and only tip of abdomen black, there are also differences in the punctures. In some lights a golden gloss may be seen on parts of the elytra.

BELONUCHUS MARGINICOLLIS sp. nov.

Black, shining, muzzle, mandibles (tips darker), antennae, palpi, elytra and legs bright castaneous. With a few dark hairs on the sides, the elytra finely pubescent.

Head flattened, base bilobed; with a few distinct punctures scattered about, including three in line with each antenna: one near it, the others near the base. Antennae scarcely passing middle of prothorax, first joint as long as second and third combined, third longer than second, the following to tenth transverse. Prothorax at apex almost the width of head, sides feebly diminishing to near base, the base itself widely rounded; with a row of large punctures on each side of middle, with some others towards and on sides, and some smaller but distinct ones on basal edge. Elytra slightly transverse, wider than head; with small and not very dense, but sharply defined punctures, and a few larger ones scattered about. Abdomen with small and moderately large punctures. Legs not very long. Length, 7 mm.

New Guinea: Komba (Rev. L. Wagner).

Structurally fairly close to *B. lividipes*, but elytra shining castaneous. The three basal joints of the antennae are shining, the others are opaque and finely pubescent. There are four punctures on the left row on the prothorax, and five on the right, of the type.

FAMILY NOSODENDRIDAE.

This family, of world-wide distribution in the tropics, was at one time considered as belonging to the Byrrhidae. The Eastern species were recently revised by Champion (1). The following Australasian species are known:

NOSODENDRON AUSTRALE Fairm. New Caledonia.
N. CALVUM Tryon. New Guinea.
N. GLABRATUM Champ. Solomon Islands.
N. OVATUM Broun. New Zealand.
N. SERIATUM Broun. New Zealand.
N. VESTITUM Tryon. New Guinea.
N. ZEALANDICUM Sharp. New Zealand.

I have to thank Mr. G. J. Arrow, of the British Museum, for the generic identification of two species from New Guinea and Fiji, and can now confidently deal with five from Australasia; all of which belong to the subgenus *Dendrodipnis*, characterized by the middle and hind tarsi received in grooves when at rest.

(1) Champion, Ann. and Mag. Nat. Hist., July-Dec., 1923, p. 578.

NOSODENDRON, Latr., Nouv. Dict. Hist. Nat., XXIV, 1804, p. 146.

Dendrodipnis, Woll., Ent. Mo. Mag., 1873, p. 33.

Dendropinis, Tryon, Col. Brit. N. Guinea, in Rept. Admin., 1892, App., V, p. 109.

NOSODENDRON CALVUM Tryon.

This is a large (8-10 mm.), highly polished, black species, the mentum not longitudinally impressed, with fairly large, sharply defined punctures, and the elytra with a conspicuous median band of strong punctures, and very fine ones elsewhere. There are specimens in the South Australian Museum from Mount Lamington and the Finsch Haven district. The type has perished.

NOSODENDRON VESTITUM Tryon.

The type of this species has also perished. It was described as being "uniformly clothed with short erect pubescence," and as having its mentum with a longitudinal groove; characters which readily distinguish it from all the Australasian members before me, and ally it with the subsequently described *N. hispidum* Champ., from India, Java, etc.

NOSODENDRON AUSTRALICUM sp. nov.

Black, highly polished, antennae obscurely paler.

Head with fairly dense, minute punctures. Mentum not longitudinally impressed; with fairly large and dense, sharply defined punctures. Prothorax almost four times as wide as long, sides and apex (except the median half) distinctly margined, punctures as on head. Elytra with outlines subcontinuous with those of prothorax; with regular rows of sharply defined, but not very large punctures, the derm generally with very minute punctures and minutely wrinkled. Under surface almost impunctate, except at sides. Length, 5·5–6·0 mm.

Queensland: Coen River (H. Hacker, No. 937), Kuranda (F. P. and A. R. Dodd).

An elongate-elliptic species, much smaller and somewhat narrower than *N. calvum*, and with regular rows of punctures on the elytra. Some of the specimens from Cairns are slightly smaller than those from the Coen River, and have somewhat larger seriate punctures on the elytra, and larger ones at the posterior end of the metasternum. Although when cleaned the derm is seen to be highly polished, it was difficult to remove extraneous material that adhered to most of the specimens.

NOSODENDRON INTERRUPTUM sp. nov.

Black, highly polished, antennae and tarsi obscurely reddish.

Head (including mentum) and prothorax with punctures as on the preced-

ing species. Elytra with series of rather small but distinct punctures, except that the first row on each side of the suture begins at the basal third, and the next row, although beginning at the base, is interrupted for a short distance, the third is traceable to the base, but is very feeble near it. Length, 4 mm.

Queensland: Cairns (C. J. Wild). Unique.

Smaller and more strongly convex than the preceding species, and seriate punctures of elytra different; the other punctures on the elytra, although minute, are slightly larger and more sharply defined.

NOSODENDRON MEDIOBASALE sp. nov.

Black, highly polished, antennae and tarsi obscurely reddish.

Head with crowded and small punctures, sparser and smaller in middle than on sides, with a shallow depression on each side in front, and a still more shallow one between the eyes. Mentum with dense and moderately large, sharply defined punctures, and a small mediobasal impression. Prothorax more than thrice as wide as the medium length, base somewhat sinuous, sides and sides of apex finely margined; with minute punctures becoming larger and sharply defined, but still small, on sides. Elytra with series of distinct punctures, larger in middle than elsewhere, the first row on each side of suture interrupted at the basal third, the second row also interrupted there, and ended at the middle; interstices with very sparse and minute punctures. Metasternum with sharply defined punctures at sides and posteriorly. Length, 7 mm.

New Guinea: Finsch Haven (Rev. L. Wagner). Unique.

Close to *N. australicum*, but elytral punctures not quite the same, and mentum with a mediobasal impression; *N. calvum* is much larger, and has strikingly different elytral punctures.

NOSODENDRON FIJIENSE sp. nov.

Black, highly polished, antennae dull red.

Head semicircular in front of eyes; with dense and small punctures at sides, scarcely visible elsewhere. Mentum smooth, with sparse and minute punctures. Prothorax about four times as wide as long, sides and sides of apex finely margined; with fairly numerous small punctures at sides, absent or scarcely visible elsewhere. Elytra with outlines continuous with those of prothorax; without punctures, except some minute ones on a small latero-basal space. Metasternum with a few distinct punctures. Length, 6·0–7·5 mm.

Fiji: Taveuni, in May (A. M. Lea).

Slightly wider in proportion than all the preceding species, and readily distinguished from them by the almost impunctate elytra, and minutely punctate mentum.

FAMILY TENEBRIONIDAE.

OCNERA HISPIDA Forsk. (2).

Mr. E. J. Johnston, on two recent occasions has taken this species in abundance at Wallaroo (South Australia). A specimen was standing in the South Australian Museum under the name, but thinking it desirable to have it confirmed, specimens were sent to Mr. Arrow of the British Museum, and the name was authenticated by Mr. Blair.

The species is nearly an inch in length, subopaque black, and with numerous setose granules on the upper surface (about twenty rows on each elytron), legs and parts of the under surface.

It is remarkable that, as with *Blaps gigas azorica* (3) this species so far should be known only from Wallaroo; probably (as surmised for the *Blaps*), it was brought in with ballast of wheat ships.

Fig. 1. *Ocnera hispida Forsk.* Natural size. *Photo, B. Cotton.*

FAMILY CURCULIONIDAE.

MELANTERIUS PAPUENSIS sp. nov.

♀ Black, shining. Under surface and legs sparsely clothed, upper surface glabrous.

Head with sparse and small punctures. Eyes separated less than half the width of rostrum. Rostrum long, thin, strongly curved; with small punctures, even at base. Antennae inserted about two-fifths from apex of rostrum. Pro-

(2) Forskal, Descript. Anim., 1775, p. 79.

(3) Lea, Rec. S. Aust. Mus., 1930, p. 243, fig. 1.

thorax (with head) subtriangular, moderately transverse; with numerous, but not crowded, sharply defined punctures of moderate size. Elytra subcordate, near base wider than prothorax; with regular rows of large, oblong punctures, interstices flat or feebly rounded, nowhere ridged, wider than punctures. Metasternum and basal segment of abdomen with larger punctures than on prothorax. Metasternal episterna almost vanishing before anterior hook, with a single row of punctures. Legs rather long, femora strongly and acutely dentate. Length, 5·5 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

A moderately large and rather wide, jet-black species; the first of the genus to be recorded from New Guinea. By the amended table of the genus (4) it could be associated with *M. compactus* and *castaneus*, two much smaller species from Western Australia, with which it has but little in common.

MELANTERIUS CURVIROSTRIS sp. nov.

Blackish, rostrum and legs obscurely diluted with red, elytra and antennae paler. Sides of prothorax, under surface and legs sparsely clothed, elsewhere glabrous.

Head with dense and rather small punctures. Eyes widely separated. Rostrum long, thin, strongly curved; with sparse and small punctures, but denser close to base than elsewhere. Antennae inserted almost in exact middle of sides of rostrum. Prothorax (with head) almost equilaterally triangular, sides gently rounded, base bisinuate; with dense and rather small, sharply defined punctures, becoming crowded on sides. Elytra oblong-cordate; with rows of rather large punctures, in wide striae, interstices between shoulders and suture not ridged on basal third, but all acutely ridged posteriorly, all with small punctures. Metasternum with punctures as on prothorax; the episterna each with crowded punctures at ends, but not in middle. Abdomen with dense punctures, but sparser and smaller than on metasternum, basal segment feebly depressed in middle. Femora not very strongly dentate, tibiae thin. Length, 5·5 mm.

New Holland. Type (unique), in British Museum.

A medium sized species, with unusually long and curved rostrum, even longer than on *Neomelanterius carinicollis*, and quite as strongly curved. It is allied to *M. biseriatus*, but the rostrum is longer, and the punctures on the elytral interstices are much smaller and less regular; on that species there are two sharply defined rows of punctures on each interstice. The type is probably a female, although the basal segment of the abdomen is not evenly convex.

(4) Lea, Proc. Linn. Soc., N. S. Wales, 1899, p. 454.

MELANTERIUS VILLOSIPES sp. nov.

♂ Black, antennae and tarsi reddish. Moderately clothed with white setae, becoming longer on under surface, the legs with long hairs, in addition to white setae.

Head with dense, partly concealed punctures. Eyes separated about half the width of base of rostrum. Rostrum moderately long and curved, with a fine median carina to beyond the middle; each side of it with two punctate striae, in front with numerous small but distinct punctures. Antennae inserted about one-third from apex of rostrum. Prothorax slightly transverse, sides gently decreasing in width to apex; with crowded and small, partly concealed punctures. Elytra subcordate, suddenly but not much with than prothorax; with regular rows of punctures, interstices ridged posteriorly and on the sides, with crowded punctures. Metasternum depressed in middle, with crowded punctures, except on parts of episterna. Abdomen with punctures as on metasternum, the basal segment feebly flattened in middle. Femora acutely and rather strongly dentate. Length, 3 mm.

Queensland: Stanthorpe (J. Sutton).

A small black species with submaculate clothing, from the upper surface apparently allied to *M. maculatus* and *acaciae*, but distinct from those, and from all others of the genus, by the long clothing on all the legs, although this may be confined to the male. On the type the long hairs are slightly more than half the length of the tibiae, they form a straggling fringe on each tibia, are fairly numerous on the femora and tarsi, and numerous on the abdomen, but being somewhat depressed there, are less distinct than elsewhere. The elytral interstices are sharply ridged posteriorly and on the sides, but, owing to the clothing and density of the punctures, the ridges are not as distinct as on other species having them equally acute. A second specimen has much sparser clothing (probably owing to abrasion) on the legs than on the type, but as its rostrum, metasternum and abdomen agree, it is presumably also a male.

MELANTERIUS SETISTRIATUS sp. nov.

♂ Blackish, rostrum, antennae and legs obscurely diluted with red. Moderately clothed with short, white setae.

Head with dense and small punctures. Eyes widely separated. Rostrum the length of prothorax, moderately curved; with dense punctures, becoming smaller in front, and with a feeble median carina. Antennae inserted about one-third from apex of rostrum. Prothorax small, sides rounded and decreasing in width from base to apex; with dense punctures of moderate size, crowded on sides, each containing a white seta. Elytra elongate-cordate, median sinus fairly

strong, the others feeble; with rows of fairly large punctures, in deep striae, interstices acutely ridged, except four or five at the basal third, fourth with a small tubercle at basal fourth. Metasternum with punctures as on pronotum. Basal segment of abdomen slightly concave in middle; punctures towards base stronger than on metasternum, but becoming smaller posteriorly; apical segment with a transverse depression. Femora strongly and acutely dentate, the front ones less acutely than the others. Length, 3·0–3·2 mm.

♀ Differs in having the rostrum longer, thinner, more curved, with sparser and smaller punctures, and non-carinate, and basal segment of abdomen larger and evenly convex.

North Western Australia. Types, in Macleay Museum.

Several of the elytral interstices are flattened or rounded towards the base, but as they are all more or less acutely ridged, from at least the basal third to the apex, the species, in the 1899 table of the genus, could be placed after *M. servulus;* on that species the shoulders are rounded, on this one they are very feebly produced (seen from directly above or from in front); and so the species could be associated with *M. acaciae,* although the abdominal fovea is distinctly wider than long. In general appearance it is somewhat like a small and narrow specimen of that species, but the prothorax is decidedly smaller in proportion. *M. tenuis,* also from North Western Australia, is a slightly larger species, with much less acutely ridged interstices, longer rostrum, and antennae inserted nearer the base of rostrum. The setae cause the upper surface to appear greyish, they are smaller on the elytra than elsewhere, and form a regular row on each side of each interstice. The slight tubercle on the fourth interstice is alike on both specimens, but may not be constant. On the female the three apical segments of abdomen are reddish, probably from immaturity, and the end one has a depression, but smaller than on the male.

MELANTERIUS ATRONITENS sp. nov.

Blackish, parts of rostrum, of legs, and most of antennae obscurely reddish. Upper surface almost glabrous, under surface and legs moderately clothed with white scales.

Head shagreened towards base, with sharply defined but not very large punctures in front. Eyes large, at their nearest approach separated about half the width of rostrum at base. Rostrum rather thin, moderately curved, slightly longer than prothorax; with crowded punctures on basal third, becoming sparser and minute in front, and with a feeble median ridge on basal half. Antennae inserted about two-fifths from apex of rostrum. Prothorax not much wider than long, sides gently rounded, apex about two-thirds the width of base; with dense

but not confluent, sharply defined punctures of moderate size. Elytra elongate-subcordate, considerably wider than prothorax, but shoulders rounded off, sides thence subparallel to beyond the middle, base feebly trisinuate; with rows of large punctures, becoming smaller and more deeply set posteriorly, interstices conspicuously ridged on apical slope and on sides, and each with a row of small punctures, elsewhere not ridged and with crowded and larger punctures. Under surface with punctures about as large as on prothorax, but less crowded; metasternal episterna each with an almost regular row of punctures. Basal segment of abdomen evenly convex, second about one-third shorter than first, distinctly longer than fifth, and slightly longer than third and fourth combined. Legs rather long, femora stout, front ones slightly, middle moderately, hind ones strongly dentate. Length, 6·5 mm.

North Western Australia: Onslow (— Kraatz). Unique.

A large species, in general appearance fairly close to *M. leptorrhynchus*, but the elytral interstices not ridged on the basal half (although almost as acutely ridged posteriorly), the rostrum much shorter, and the femoral teeth smaller and less acute; there is a small supplementary tooth in the notch on each femur, but it could be easily overlooked. The rostrum is about the length of that of *M. unidentatus* and *bidentatus*, but the elytral interstices are very different. At first glance the elytra appear to be glabrous, but on close examination they are seen to have a row of minute white setae on each side of each interstice; on the disc of the pronotum each puncture has a minute seta, but they become distinct on the sides. The front margin of the prothorax appears as a narrow, highly polished rim. The type appears to be a female.

MELANTERIUS LATUS Lea.

A specimen of this species, from Cairns, and another from the Tweed River, are slightly larger, 5 mm., than the types, and the Tweed River one has elytra entirely dull red. A specimen, from "Australia" in the British Museum, is probably a female, it differs from the type in being still larger, 6·5 mm., rostrum longer, thinner, with sparser and smaller punctures, and prothorax with fewer punctures longitudinally confluent.

MELANTERIUS VENTRALIS Lea.

The type of this species is a male. A specimen from Bulladelah (New South Wales), in the National Museum, is evidently a female, it differs in having the rostrum longer, thinner, more curved and polished, except for a punctate space close to base; the abdomen is very sparsely clothed, the second segment is larger, evenly convex, its tip not elevated or produced over the third, and the third and

fourth are each slightly smaller than the second, although decidedly larger than usual in the genus.

MELANTERIUS IMPOLITUS Lea.

A specimen from Sydney, in the National Museum, appears to be a male of this species; but is much darker than the type (which, however, is almost certainly immature), the derm of the upper surface being almost black. It differs in having the rostrum slightly stouter and less curved, with a fine median carina to beyond the middle, with crowded punctures on basal half, and numerous distinct ones elsewhere, some of the lateral interstices of elytra rather acutely ridged, the trochanter of each middle leg with a small fascicle, and the abdomen with denser and longer clothing, the apical segment with a large median fovea, the third and fourth large, and each slightly larger than the second. It is allied to *M. ventralis*, but differs from its male in having the basal segment of abdomen smaller, neither elevated at the apex, nor encroaching on the second, the fovea on the apical segment much smaller, and in the trochanters of the middle legs. *M. fasciculatus* is a larger black species, with larger fascicles and elytral interstices acutely costate. The type was evidently somewhat abraded; on the Sydney specimen the clothing of the upper surface is not very dense, except that the prothorax is slightly vittate, and that on the elytra there are numerous spots, mostly placed in the striae connecting two interstices.

MELANTERIUS LEGITIMUS Lea, var.

A male from Townsville (Queensland) in the British Museum, agrees in size and appearance with the type of this species, has some of the elytral interstices acutely ridged to the base, and each femur with a supplementary tooth in the notch. It differs, however, from the type, and some South Australian specimens, in having the prothoracic punctures less crowded, and the clothing on the legs less conspicuous. It should perhaps be considered as representing a variety.

NEOMELANTERIUS INTERRUPTUS Lea, var.

A specimen, from the Mandated Territory of New Guinea, possibly belongs to this species, but differs from the type, and a second specimen, in having the setae more stramineous than white, the rostrum slightly longer than the prothorax and quite straight, its basal carinae less conspicuous (owing to more numerous setae), the scape inserted two-fifths from apex of rostrum, and as long as the funicle and club combined; all the tibiae are strongly curved at the base, the hind ones much more noticeably than the same pair of the types. The differences do not appear to be sexual. In general the species appears to be intermediate be-

tween those of the genus with long curved rostrum, and *Euthebus troglodytes*, but on the latter species the front and middle coxae are much more widely separated.

DIETHUSA INCISIPES sp. nov.

♂ Blackish-brown, legs and antennae paler. Densely clothed with whitish and purplish-brown scales, becoming pure white on under surface.

Rostrum moderately curved, slightly longer than prothorax, somewhat dilated, and with crowded, concealed punctures near base, shining and with sparse and small ones elsewhere. Antennae inserted about one-third from apex of rostrum. Prothorax slightly transverse, sides rapidly diminishing in width to apex; with crowded, concealed punctures. Elytra subcordate, behind shoulders wider than prothorax, base strongly trisinuate; striate-punctate, the striae and punctures considerably narrowed in appearance by the clothing. Basal segment of abdomen shallowly depressed in middle, apical with a small fovea. Femora strongly and acutely dentate, front tibiae falcate, with a strong apical hook and small apical fascicle, hind tibiae with a rather sharp apical notch, the middle ones rather feebly notched. Length, 3·2–3·4 mm.

Queensland: Stradbroke Island (H. J. Carter). Type, in National Museum; cotype, in South Australian Museum.

Allied to *D. falcata*, but slightly larger, and dark prothoracic marking dilated to base, instead of strongly narrowed there, the hind tibiae are also different. *D. picta*, with somewhat similar base of elytra, has very different legs. The colours, but not the disposition of the scales, are almost as on *D. nigrosuturalis*. In appearance it is close to *D. apicispina*, but all the tibiae are very different. On the type the darker scales form two small spots on the front of the head, an irregular median vitta dilated to base on the pronotum, and numerous spots on the elytra, covering more of the surface than the whitish scales. On a second specimen the prothoracic vitta is more narrowed to the apex, and the white spots and scales on the elytra cover almost half the surface, being more numerous posteriorly and on the sides than on the type. There are a few setae on the apical sides of the rostrum. Seen directly from above, each shoulder is seen to clasp the base of the prothorax, and to be slightly more produced than the swelling adjacent to the suture. The middle tibiae might fairly be regarded as bisinuate on the under surface, but the hind ones are distinctly notched near apex.

DIETHUSA TRUNCATIDENS sp. nov.

♀ Dark brown, rostrum, antennae and legs paler. Densely clothed with scarlet and stramineous scales, becoming white on under surface.

Rostrum slightly longer than prothorax, rather thin and parallel-sided; with

a few punctures about muzzle and at extreme base, elsewhere polished and almost impunctate. Antennae inserted about two-fifths from apex of rostrum. Prothorax more convex than usual, slightly transverse, sides rounded, base twice the width of apex; with dense, concealed puntures. Elytra cordate, not much wider than prothorax, base gently trisinuate; with fairly large punctures, in rather wide striae, but punctures appearing much smaller and striae narrower through clothing. Two basal segments of abdomen large and strongly convex. Femora stout, each with a strong truncated tooth, front and middle tibiae stout, dilated to apex, and each with a long apical spine. Length, 4 mm.

New South Wales: Wagga Wagga, in November (W. W. Froggatt). Unique.

Allied to *D. squamivaria* and *metasternalis*, but front and middle tibiae shorter, more dilated to apex, the apex itself sloping at an angle of 45°, and the apical spine much longer, although on both commencing at the upper apex; the spine on each front tibia is so long, that, if drawn backwards, it would almost extend to the base of the tibia itself. *D. trifasiata* and *pretiosa* are smaller species, with somewhat similarly coloured scales, although differently disposed, but with very different front tibiae. *D. aulica* has very different tibiae *D. metastenalis* has acutely dentate femora. The stramineous scales form a median line on the head, and are numerous at the sides of and behind the eyes, on the pronotum they form a median line, which at the middle is dilated to form an irregular basal patch, they are irregular on the side parts that are visible from above, but dense and paler on the lower parts, on the elytra they are irregularly deposited in spots and fasciae, that cover about half the surface.

DIETHUSA NIGRICLAVA sp. nov.

♀ Reddish-brown, club of antennae black. Rather densely and uniformly clothed with whitish scales.

Rostrum the length of prothorax, rather thin, parallel-sided and evenly curved; with a few punctures at extreme base, elsewhere polished and impunctate. Antennae inserted two-fifths from apex of rostrum. Prothorax moderately transverse, base twice the width of apex; with crowded, partly concealed punctures. Elytra oblong-cordate, suddenly but not much wider than prothorax, base feebly trisinuate; with comparatively small punctures, in deep striae, not much concealed by clothing. Two basal segments of abdomen large and evenly convex. Hind femora slightly dentate, the others edentate, tibiae rather long. Length, 4 mm.

New South Wales: Sydney, in flood debris (H. W. Cox). Type (unique), in National Museum.

The front and middle femora are truly edentate, and the hind ones from some

directions also appear edentate, but from others may be seen to have a small, acute tooth. *D. blackburni*, with uniformly pale clothing, has all femora conspicuously dentate. *D. congrua* and *basipennis*, some specimens of which have almost entirely pale clothing, have base of elytra very different. *D. inermis* has very different clothing and rostrum. *D. pallida* and *simplicipennis* are smaller species, with denser clothing, reducing the apparent size of the punctures in the elytral striae.

DIETHUSA MAJORINA Lea.

Although not noted in the original description, the sexes of this species may be distinguished by the abdomen; on the male the basal segment is shallowly depressed, and with a fine median line, denoting an approach to *D. metasternalis*, although the clothing is not conspicuously different there from the adjacent parts, as it is on the male of the latter species.

DIETHUSA METASTERNALIS Lea, var. BOREALIS var. nov.

Three speciment, one male and two females, from North Australia in the British Museum, appear to represent a variety of this species. The male has the median groove of the basal segment of abdomen and metasternum filled with golden setae as on the type, and the female has somewhat similar front tibiae, except that the spur commences lower down the sloping apex. The clothing of the upper surface differs considerably, however, being stramineous and white, instead of scarlet and stramineous; possibly the difference is due to age; the types of the species were described shortly after capture, whereas the Museum specimens were taken many years ago.

DIETHUSA SUBAURIFERA Lea, var.

Five specimens from Stanthorpe, Queensland, appear to represent a variety of this species, they differ from the typical form in having the scales more stramineous and white, than rusty-red and whitish, the elevation and undulation of the interstices are more pronounced (partly accentuated by pale spots) so that they might fairly be regarded as subtuberculate, each side of the middle of the pronotum also appears subtuberculate.

PSYDESTIS PICTIPENNIS sp. nov.

♂ Reddish, parts of under surface blackish. Densely clothed with stramineous scales, variegated with sooty-brown, becoming whitish on under surface.

Rostrum slightly shorter than prothorax, straight to near apex and then gently curved; with dense punctures, except on a feeble median ridge. Antennae inserted about one-third from apex of rostrum. Prothorax with sides rounded and decreasing in width from base to apex; with crowded, concealed punctures.

Elytra wide, sides rounded and subcontinuous with those of prothorax, base trisinuate, the lateral incurvatures rather feeble; with rows of large, partly concealed punctures; interstices wide and acutely ridged, the odd ones slightly elevated above the others. Basal segment of abdomen slightly longer than three following ones combined, widely and shallowly depressed in middle, second shorter than third and fourth combined. Femora stout, and obtusely dentate. Length, 4–5 mm.

♀ Differs in having the rostrum slightly more curved, its punctures somewhat smaller, antennae inserted less close to apex, elytra wider, with outlines less continuous with those of prothorax, abdomen larger, the basal segment evenly convex, and front tibiae with a more conspicuous notch between the apical hook and subapical tooth.

Queensland (— Kraatz).

With the comparatively short parallel-sided rostrum, finely faceted eyes and short second abdominal segment of *P. affluens*, but the dark scales cover much less of the upper surface. On the type they form a small spot on each side of the base of the prothorax, and two close together at apex; on each elytron they form two transverse spots or abbreviated fasciae, one just before and one just behind the middle, with a small spot on the suture at the base and one near the apex. On one female the spots at the base of the prothorax are feeble, and the apical ones absent, on its elytra the spots are more irregular, but there is an asymmetrical median fascia. On a second female the prothoracic spots are entirely absent; on the elytra there are some small spots and two very irregular fasciae.

BYRSIA BINODIPENNIS sp. nov.

♂ Black, antennae obscurely paler. Densely clothed with blackish and whitish scales.

Rostrum the length of prothorax, rather thin, gently curved; with dense and small, but sharply defined punctures, concealed only at extreme base. Antennae thin, inserted one-third from apex of rostrum, scape not reaching eyes. Prothorax about as long as wide, sides strongly rounded, punctures concealed, with a feeble median line. Scutellum distinct. Elytra oblong-cordate, much wider than prothorax, with deep punctures in narrow striae, partly (in places almost entirely) concealed by clothing, a small but distinct tubercle (preapical callosity) at the junction of the fifth and seventh interstices near apex. Pectoral canal wide, shallow and not acutely walled, clothed throughout. Two basal segments of abdomen large, faintly depressed in middle. Front and middle coxae slightly separated, femora stout, edentate. Length, 5·2–5·5 mm.

♀ Differs in having the rostrum slightly longer than prothorax, thinner,

more curved and with smaller punctures, although fairly dense, and two basal segments of abdomen larger and rather strongly convex.

Western Australia: Cue and Ankertell (H. W. Brown); East-West Railway: Kychering Soak (National Museum, from — Chandler).

In some respects fairly close to *B. cerata*, but the prothorax longer in proportion, and without a mediobasal fovea, elytra conspicuously binodose, the tarsi shorter, with the claw-joint shorter, the claws more divergent, and clothing different. With the scapes at rest in the scrobes, they are seen to terminate some distance from the eyes, a most unusual character in the subfamily; in *cerata* they almost touch the eyes. In general appearance the types are like elongated specimens of *Aonychus luctuosus*. The blackish or dark brown scales cover the head, except for a few whitish ones at the base and near the eyes, form a wide and very irregular median vitta on the pronotum, and almost connected along the front edge with the pectoral canal, clothe the elytra, except for an irregular white postmedian fascia, and some minute spots, form spots on the apical half of abdomen and rings on the femora and tibiae; most of the white scales on the under surface have a silvery gloss, in places slightly tinged with green or golden-green. On the type male only there are some ochreous scales on the elytra, on one female the scales on the three apical segments of abdomen are almost entirely black.

DERETIOSUS AMPLIPENNIS sp. nov.

Black, some parts obscurely reddish. Densely clothed with slightly variegated, dark brown scales and setae, the latter forming fascicles on upper surface.

Head with a shallow, interocular impression. Rostrum rather long and strongly curved; apical two-thirds shining, and with numerous small punctures. Prothorax moderately transverse, subtriangular; with numerous small, normally concealed punctures. Elytra much wider than prothorax, not twice as long as wide, base trisinuate, sides parallel to beyond middle; striate-punctate, striae appearing fine through clothing, and punctures almost or quite concealed. Femora stout, strongly and acutely dentate, tibiae strongly arched at base, upper edge incurved near apex. Length, 9 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

A rather large and unusually wide species, not very close to any previously named. There are two conspicuous fascicles at the apex of prothorax, and four feeble ones across middle; on each elytron there are two elongate fascicles on the third interstice, one near the base, the other submedian, in addition each interstice has numerous small pustules, many of which have a stout, central seta; there is a small velvety patch immediately behind the scutellum. The head has several lines of pale clothing, which give it an appearance as of faint impressions. In

places where the clothing has been removed, the punctures of the abdomen are seen to be very small. The type is probably a female.

On this, and on all the following species, the antennae are inserted slightly nearer the apex than base of rostrum, and are of but little use in identifying the species.

DERETIOSUS LATUS sp. nov.

Dark brown, some parts paler. Densely clothed with scales, and with numerous stout setae.

Rostrum moderately long, strongly curved, parallel-sided; with crowded and rather small punctures on apical half, concealed elsewhere. Prothorax small, subtriangular; with crowded, concealed punctures. Elytra much wider than prothorax, not twice as long as wide; striate-punctate, the striae slightly indicated through clothing, and the punctures almost or quite concealed. Two basal segments of abdomen large, and strongly convex. Femora stout, strongly and acutely dentate, tibiae arched at base. Length, 4·5 mm.

Papua: Mount Lamington (C. T. McNamara), Dorey (Pascoe collection from A. R. Wallace, in British Museum).

An unusually wide species, the proportions being much as those of the preceding one, which is much larger and otherwise very different. On the type the scales are mostly of a pale slaty-grey, becoming darker posteriorly, and on the three apical segments of abdomen; its prothorax has a large, angular, blackish patch, widest at base, and narrowed to middle, where it has two small, dark fascicles, and is abruptly terminated; there are two small fascicles on the third interstice on each elytron, and numerous feeble pustules on most of them, many of which have a stout, central seta, but many others are without such. On the specimen in the British Museum the scales are mostly of a light brown, with the large mediobasal patch on the pronotum less sharply defined, and with a velvety patch behind the scutellum. Its abdomen is much abraded, exposing numerous minute punctures, and deep sutures between the second and fifth segments. The specimens are probably females.

DERETIOSUS CARINIROSTRIS sp. nov.

♂ Blackish-brown, antennae and tarsi reddish. Densely clothed with greyish or greyish-brown scales, and with numerous stout, erect setae, some of which are spathulate.

Rostrum rather long and strongly curved; apical third shining and with small punctures, elsewhere squamose, but a fine median carina traceable. Prothorax small, subtriangular; with crowded, concealed punctures. Elytra much wider than prothorax, about twice as long as wide, parallel-sided to near apex,

base trisinuate; striate-punctate, striae slightly indicated through clothing, but punctures, which are moderately large, almost or quite concealed. Two basal segments of abdomen large and slightly flattened in middle. Femora stout, strongly and acutely dentate, tibiae arched at base, and bisinuate on lower surface. Length, 4·3–4·5 mm.

♀ Differs in having rostrum slightly longer and thinner, more of its surface glabrous and with smaller punctures, median carina shorter, and abdomen evenly convex.

Papua: Mount Lamington (C. T. McNamara).

About the size of the preceding species, but somewhat narrower, and with more numerous and longer erect bristles; it also approaches *D. hystricosus,* but the setae do not form fascicles on the prothorax, and the elytra are without a dark apical spot. The scales are mostly of a pale grey, or dark stramineous, and so dense that the derm, except of part of the rostrum, is everywhere concealed; on the under surface they are uniform in colour, but on the upper surface slightly mottled; there is also a faint, pale, reversed V on the elytra, the sides of which are directed towards the suture at the summit of the apical slope, but do not quite reach it. The setae are numerous on the upper surface and legs; they form a row on each interstice on elytra (but are easily disarranged), and an elongated fascicle on the third near base, there are also a few setae on the head and rostrum.

A male from Wareo (Rev. L. Wagner) probably belongs to this species, but has almost uniform rusty-brown scales (paler on the under surface, but not as pale as on the types) and sparser setae; the latter probably being partly abraded.

DERETIOSUS COLLARIS sp. nov.

♂ Dark brown, antennae paler. Densely clothed with dark rusty-brown, slightly variegated scales and setae, and with a narrow black fascia, half-way down the apical slope.

Rostrum the length of prothorax, moderately curved, parallel-sided; punctures visible only at tip. Prothorax rather small, subtriangular; with crowded, concealed punctures. Elytra not much wider than prothorax, parallel-sided to near apex, almost twice as long as wide; with regular rows of rather large punctures, normally concealed by clothing. Two basal segments of abdomen large, almost flat in middle. Femora stout, strongly and acutely dentate, tibiae bisinuate on lower surface, the basal sinus much wider than the other. Length, 5 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

A rather robust species, with a distinctive fascia, and several conspicuous fascicles. The clothing on the scutellum and under surface is paler than elsewhere, but on the upper surface the scales are almost uniformly coloured through-

out, except for a narrow, velvety-black fascia, which extends across four interstices on each elytron; there are six fascicles on the prothorax, two long ones at apex, and four smaller ones across middle; on the elytra there are numerous pustular elevations, usually with a short, stout, central seta; there are also two elongate fascicles of short setae on the third interstice on each elytron, one near the base, the other submedian. From certain directions an oblique ridge may be seen on each side of the prothorax, commencing close to the shoulder, and directed obliquely forwards, to end crowned with an outer fascicle of the median row. The scutellum is distinctly elevated, almost as on the species of *Ophrythyreocis*.

DERETIOSUS SQUAMIPENNIS sp. nov.

Blackish, antennae and tarsi reddish. Densely clothed with dingy brown scales and setae, conspicuously variegated on elytra, feebly mottled on under surface and legs.

Rostrum about the length of prothorax, parallel-sided, moderately curved; apical half naked and with small but sharply defined punctures. Prothorax rather small, sides rounded, apex half the width of base; with crowded, concealed punctures. Elytra not much wider than prothorax, parallel-sided to near apex; striate-punctate, striae indicated through clothing, the punctures almost or quite concealed. Femora stout, strongly and acutely dentate. Length, 5 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

A subcylindrical species, narrower than the preceding, and with different fascicles and markings. On *D. v-niger*, from Fiji, the sides of the V extend to the shoulders. On the elytra of the present species there is a conspicuous, wide black V, about one-third from the apex, and obscurely connected with the sides about the middle, beyond it the clothing is distinctly paler than before it. Each elytral interstice has numerous small pustules, mostly with a short, upright, central seta; the third interstice has a fairly large fascicle near the base, velvety-black in front, but brown posteriorly; on the prothorax the setae are numerous, but short and not forming fascicles. The basal segment of abdomen is slightly flattened in middle, but, as only half of the rostrum is densely clothed, the type is probably a female.

DERETIOSUS PUSTULOSUS sp. nov.

Dark brown, antennae paler, except club. Densely clothed with greyish or ashen, slightly variegated scales, becoming darker on apical half of abdomen, and with numerous, short, stout setae.

Rostrum long and thin, strongly curved, clothed only near base; elsewhere shining and with small punctures. Prothorax moderately transverse, apex sud-

denly narrowed; with crowded, concealed punctures. Elytra not much wider than prothorax, more than twice as wide as long, parallel-sided to near apex; with striae and punctures indicated through clothing. Femora stout, strongly and acutely dentate. Length, 5–6 mm.

New Guinea: Wareo (Rev. L. Wagner).

With numerous pustular elevations on the elytra, as on the preceding species, but without a black fascia. The setae on the upper surface are numerous but not long, those on the elytra seldom distinctly arise above the pustules in which they are placed. There is a rather long, sponge-like fascicle near the base, on the third interstice, containing about seven stout setae. The prothorax has but few setae, and those are very short. From directly in front the prothorax is seen to have an obtuse median ridge, extending more than half-way across the surface, but interrupted in the middle, and another slightly oblique one, beginning on each side, at the subapical constriction, and widely interrupted in the middle. The two basal segments of abdomen are flattened in middle, but the clothing of the rostrum probably indicates that the two specimens taken are females.

DERETIOSUS LATERIPENNIS sp. nov.

♂ Black, some parts obscurely reddish, antennae paler. Densely clothed with ashen, slightly variegated scales, becoming paler on under parts; a conspicuous blackish spot on the middle of the side of each elytron. With numerous stout, erect setae, becoming sparser, shorter, and depressed on under surface.

Rostrum long, thin and strongly curved, basal third squamose, elsewhere shining and with minute punctures. Prothorax scarcely wider than long; with crowded, concealed punctures, and a fine, concealed median carina. Elytra elongate, not much wider than prothorax, parallel-sided to near apex. Pectoral canal triangularly cutting for a short distance into metasternum. Femora stout, strongly and acutely dentate. Length, 3·8–4·8 mm.

♀ Differs in having rostrum longer, thinner, with scarcely visible punctures, less of its base clothed, and abdomen more convex.

Papua: Mount Lamington (C. T. McNamara). Abundant.

An elongate, slightly depressed species, from the upper surface apparently belonging to *Chaetectetorus* or *Pseudapries,* but with the pectoral canal of *Deretiosus;* the tip of the canal cuts triangularly into the metasternum, but not sufficiently long for the species to be referred to *Dystropicus.* On many specimens the scales on the upper surface are pale brown, with numerous paler, almost white, vittae, and many small, dark spots, but the blackish spot on each side is fairly large, oblong, and invisible from above; there are usually two pale brown spots on the head. There are no pustules on the elytra, the setae arising in a regular

row on each interstice; on the pronotum the setae are often in four irregular rows, and in places are compacted to form fascicles, of which there are usually two fairly distinct ones in the middle. On specimens in perfect condition the elytra appear to have small punctures in fine striae, but on complete abrasion striae are seen to be present only on the sides and posteriorly, elsewhere the punctures are fairly large, suboblong, and in regular rows.

DERETIOSUS PARVUS sp. nov.

Dark brown, rostrum, antennae and tarsi reddish. Densely clothed with mottled brown and grey scales, becoming white on under parts; with numerous short, stout setae scattered about.

Rostrum rather long, thin, and strongly curved; squamose only near base, elsewhere shining and with scarcely visible punctures. Prothorax rather strongly transverse, apex about half the width of base; with crowded punctures indicated through clothing, and with a feeble median carina. Elytra not much wider than prothorax, parallel-sided to near apex; with regular rows of fairly large punctures, almost or quite concealed by clothing, but the striae appearing fine and regular through it. Legs short, front femora strongly and acutely dentate, the others less strongly, tibiae angular at outer base, apical hook widely diverging from apex. Length, 3 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

The smallest species hitherto known from New Guinea. The clothing has a slight pustular appearance on the elytra, but has been partly abraded, the third interstice near the base has an obscure fascicle, the setae on the prothorax are fairly numerous, but do not form fascicles. On the head there is a pale median line, and two small, pale spots. The pectoral canal is squamose throughout, its end appears as a slight incurvature of the metasternum, with its lower part in two planes, the higher one between the middle coxae. The type is probably a female.

DERETIOSUS FASCICULICEPS sp. nov.

♂ Blackish, antennae and tarsi obscurely reddish. Densely clothed with whitish-stramineous scales, variegated with pale brown; with stout setae, confined to fascicles and pustules on upper surface, but free on legs.

Rostrum comparatively stout, moderately curved; apical third opaque and with crowded punctures, elsewhere densely clothed. Prothorax moderately transverse, sides subparallel to beyond the middle, and then suddenly narrowed and slightly depressed; with crowded, concealed punctures. Elytra much wider than prothorax, parallel-sided to near apex; with rows of punctures, in striae indicated

through clothing. Basal segment of abdomen flat in middle, apical with a shallow depression. Femora stout, strongly and acutely dentate, tibiae arched at base. Length, 5·5 mm.

Fiji (Bowring collection). Type (unique) in British Museum.

A pallid species. Its nearest Fijian ally is *D. lectus,* but on that species the fascicles on the third interstice are larger, the small median ones on the pronotum are black, the head is nonfasciculate, and the rostrum is decidly thinner. The positions of the prothoracic fascicles, and the pustules on the elytra, are somewhat as on *D. exithioides,* but on that species there is a black sutural mark, and the head is not fasciculate. The clothing is mostly pale stramineous, with faint brown mottlings on the under surface and legs, as well as on the upper surface; there are two distinct fascicles on the front of the head, immediately behind which is a narrow, white fascia; on the prothorax there are two small fascicles in front, and six in front of the middle, of the latter the two median ones are very small, and the outer one on each side partly concealed from above. On the odd interstices of elytra there are numerous pustules, each with a stout central seta, and there is a small fascicle on the third interstice near base.

DERETIOSUS ALPHABETICUS sp. nov.

♀ Dark brown, antennae paler. Densely clothed with rusty-brown scales, becoming paler on under parts; elytra with a large blackish V, outlined with paler scales; upper surface with short, stout setae, mostly confined to fascicles on prothorax, and to pustules on elytra.

Rostrum rather thin and moderately curved; apical half shining and with small punctures, elsewhere squamose. Prothorax moderately transverse, sides suddenly narrowed near apex; with crowded, concealed punctures. Elytra scarcely wider than prothorax, parallel-sided to near apex; striae indicated through clothing, but punctures concealed. Two basal segments of abdomen large and evenly convex. Femora stout, strongly and acutely dentate. Length, 4·5 mm.

Torres Straits: Murray Island. Type (unique) in British Museum.

A rather narrow, subcylindrical species, each interstice with a row of small pustules, each of which has a short, central seta; on the third interstice, near base, there is an obscure, fasciculate swelling; on the prothorax there are remnants of six fascicles in the usual positions. On the elytra there is a large dark V, the parts commencing on the shoulders, and meeting on the suture beyond the middle; a second dark V is indicated beyond the first, but is incomplete. *D. v-niger,* from Fiji, is a distinctly wider species, the V is wider at the suture, the pustules are more pronounced, and the abdominal clothing is darker.

DERETIOSUS ZICZAC sp. nov.

Dark brown, rostrum, antennae, and tarsi paler. Densely clothed with dark and pale brown scales, becoming paler, but not uniform, on under parts; with numerous setae scattered about and compacted into fascicles.

Rostrum long, thin, and moderately curved; squamose and setose on basal third, elsewhere shining and with minute punctures. Prothorax moderately transverse, sides strongly rounded; with crowded, concealed punctures and a fine median carina. Elytra much wider than prothorax, not twice as long as wide, parallel-sided to about middle; with rows of moderately large, concealed punctures. Two basal segments of abdomen large and evenly convex. Femora stout, strongly and acutely dentate, the front ones less strongly than the others; tibiae angular at outer base, apical hook less conspicuous than usual. Length, 2·5 mm.

New South Wales (C. F. Deuquet).

A comparatively wide species, smaller than any previously described from Australia, but slightly larger than some of the Fijian specimens of *D. minutus*. The type is in perfect condition, on its head there are three small dark spots and two loose fascicles, on the prothorax there is a narrow dark cross, the elytra appear multimaculate, and the summit of the apical slope is crowned by a narrow, pale, zigzag mark, on each elytron it goes obliquely backwards from the suture, then obliquely forwards, then straight backwards, and then obliquely backwards to near the margin; on the scutellum the scales are whitish. There are numerous setae on the prothorax, and six fascicles in the usual positions; on the elytra there are lines of setae and some small fascicles, and two larger ones on the third interstice, one near the base, the other submedian. On a second specimen the markings, owing to partial abrasion, are less distinct. Each is probably a female.

DERETIOSUS SANCTUS sp. nov.

Dark brown, antennae paler. Densely clothed with light brown scales, becoming paler on under surface, and variegated with paler and darker spots, including a pale X on elytra, and a large, subtriangular, black spot on each side. With numerous short, erect setae, on the elytra confined to a single row on each interstice, on the prothorax, in places, compacted to form loose fascicles.

Rostrum long, thin and strongly curved; basal half squamose and setose, elsewhere shining, and with small but sharply defined punctures. Prothorax moderately transverse, sides rounded, near apex suddenly narrowed; with crowded punctures indicated through clothing. Elytra not much wider than prothorax, almost parallel-sided to near apex; striate-punctate, the punctures rather large, but appearing much smaller through clothing. Abdomen with two basal segments large and widely flattened in middle. Femora stout, strongly and acutely dentate. Length, 6 mm.

Queensland: Endeavour River. Type (unique) in Macleay Museum.

Fairly close to *D. lateripennis,* and with almost identical legs, but larger, wider, prothorax wider in proportion, and elytra with a pale X, the arms of which cross the suture, slightly beyond the basal third, and the front ends of which rest on the shoulders; the dark spot on each side is not narrow and almost confined to one interstice, as on that species, but occupies three interstices, and is partly visible from above; each femur also has a dark spot. In general appearance it is fairly close to *Dystropicus tanyrhynchus,* and has somewhat similar rostrum and legs, but on that species the pectoral canal cuts deeply into the metasternum, on this species the canal ends at it. The type is probably a male.

DERETIOSUS ARIDUS Pasc.

D. blandus Lea, var.

A long series of specimens, from Cairns, appears to connect *D. blandus* with *D. aridus;* although the type and other specimens of *blandus* appear to be very distinct from the typical form.

DERETIOSUS EREMITUS Pasc. (formerly *Apries*).

The genotype of *Deretiosus* (*aridus* Pasc., Journ. Linn. Soc., Zool., XI, p. 184, pl. viii, fig 10, from New Guinea), was described as having the pectoral canal "*indeterminata, metasterno impingens,*" and "open at the sides and impinging on the metasternum"; in the same paper *Apries* (genotype *eremita* Pasc., p. 196, pl. ix, fig. 6, from Batchian) was described as having the pectoral canal "*apice cavernosa*". The excellent figure of the latter is so like a species from New Guinea, in the South Australian Museum, that I thought it probably belonged to it; but this species has the canal open at the apex, in exactly the same way as in *aridus,* and many other species of *Deretiosus.* For the canal to be truly cavernous at its apex the intercoxal process, nearly always of the mesosternum, should be arched over, concealing the tip of the rostrum when at rest.

I, therefore, sent a specimen of the New Guinea species in question to Mr. Arrow, of the British Museum, asking him to compare it with the type and he wrote that it "appears to me to be the same as *Apries eremita* Pasc. We have a specimen from the Philippine Islands, so the distribution is evidently very wide. The pattern is very variable, but your specimen agrees closely with the type in this."

Pascoe also wrote of *Apries,* "The groove immediately before the eye, the peculiar character of this genus, terminates in the scrobe." But the same groove may be seen in *aridus,* and in most species of *Deretiosus,* although less pronounced.

A. eremita, therefore, should be referred to *Deretiosus,* and *Apries* considered a pure synonym of that genus.

MECHISTOCERUS GRANIBASIS sp. nov.

♂ Black, antennae reddish. Irregularly clothed with brick-red scales and setae, becoming whitish on under surface.

Head with crowded punctures, and a narrow, deep, interocular impression. Rostrum the length of prothorax, evenly curved, basal half with fine ridges and coarse, squamiferous punctures, elsewhere with small, naked punctures. Antennae inserted about two-fifths from apex of rostrum, club the length of four preceding joints. Prothorax almost as long as wide, sides subparallel to near apex; with crowded, sharply defined punctures, except where concealed in front; with a short median carina. Elytra rather long, not much wider than prothorax, base trisinuate, shoulders feebly clasping base of prothorax; with rows of large, deep punctures, suboblong on basal half, smaller and rounded posteriorly; with numerous small granules on basal half, more numerous on the third, fifth, and seventh interstices than on the others. Metasternum with dense punctures, slightly smaller than on prothorax. Basal segment of abdomen widely concave, second flattened in middle, each with fairly numerous and rather large punctures, the apical with crowded ones. Femora stout, strongly and acutely dentate, tooth on each hind one larger than the others; tibiae long and thin. Length, 7–8 mm.

♀ Differs in having less of the rostrum coarsely sculptured and the two basal segments of abdomen gently convex in middle.

New Guinea: Wareo (Rev. L. Wagner); Sattelberg (—v. Bennigsen).

Approaching *M. cancellatus*, *metasternalis*, and *magnidens*, and several other species from Queensland, but distinct by the basal granules of elytra. The femoral dentition is much as on *magnidens*. On several specimens the elytral scales are of a rather bright brick-red colour, obscurely variegated with transverse fasciae, and patches of sooty-brown scales; each interstice has a row of stout setae (distinct from the sides), usually of the same colour as the adjacent scales. The apex of the prothorax is densely squamore, elsewhere its clothing consists of a seta in each puncture. On the femora the scales are fairly dense. The elytral punctures are partly obscured by clothing, especially on the apical half, their containing striae are distinct on the sides but feeble elsewhere.

MECHISTOCERUS SORDIDUS sp. nov.

♀ Black, antennae reddish, apex of rostrum and parts of legs obscurely diluted with red. Densely clothed with muddy-brown scales, and with numerous erect setae.

Head with dense punctures, and with a narrow, deep, interocular impression. Rostrum slightly longer than prothorax, evenly curved, about base with fine ridges and coarse, setiferous punctures, elsewhere shining and with minute punc-

tures. Antennae inserted slightly nearer apex than base of rostrum, club the length of four preceding joints combined. Prothorax moderately transverse, sides almost parallel to apical third; with crowded, partly concealed punctures, and a faint remnant of a median carina. Elytra distinctly wider than prothorax, parallel-sided to beyond the middle, base trisinuate, shoulders slightly clasping base of prothorax; with rows of large, oblong punctures, becoming smaller and rounded posteriorly, and on the sides set in feeble striae. Metasternum with crowded and rather large punctures, and with a narrow median line. Two basal segments of abdomen evenly convex, and with sharply defined punctures, not very close together, except for a basal row. Femora stout, strongly and acutely dentate, tooth on each hind femur large, and equilaterally triangular; tibiae long and thin. Length, 6·5 mm.

New Guinea (—v. Bennigsen).

In general appearance like *M. punctiventris*, from New South Wales and Queensland, but abdominal punctures very different and elytral setae more numerous. It is a dingy species, with femoral dentition much as on *M. magnidens*, and the preceding species, but prothorax very differently clothed. At first glance the scales on the upper surface appear to be of an uniform, dingy brown colour, but on close examination they are seen to be slightly variegated on the elytra; on the under parts they are paler. The setae are very distinct from the sides, they are longer on the elytra than on the pronotum, and form a distinct row on each interstice.

MECHISTOCERUS MACULIBASIS sp. nov.

♀ Black, antennae and tarsi reddish. Elytra moderately clothed with muddy-brown and greyish scales, irregularly mixed; each interstice with a row of semierect setae, each prothoracic puncture with a seta; under surface moderately clothed, the legs more densely so.

Head with crowded punctures, and a narrow, deep interocular impression. Rostrum slightly longer than prothorax, evenly curved; with ridges and coarse, setiferous punctures on basal third, elsewhere with minute punctures. Antennae inserted almost in middle of rostrum. Prothorax slightly transverse, base truncate, sides subparallel to beyond the middle, and then rounded to apex; with crowded, sharply defined punctures, and a feeble median carina. Elytra elongate-subcordate, considerably wider than prothorax, shoulders rounded, sides parallel to beyond the middle; with rows of large, oblong punctures; becoming smaller and rounded posteriorly. Metasternum with punctures much as on pronotum. Two basal segments of abdomen evenly convex, the first with large punctures about base, becoming smaller posteriorly, where they are about as large

as on the second segment, apical segment with crowded punctures; the third and fourth each with a single row of rather distant ones. Femora stout, strongly and acutely dentate, the hind femora with larger teeth than the others; tibiae long and thin. Length, 7 mm.

New Guinea (Paul Hossfeld) Herbertshöh (—Pape).

A dingy species, in general appearance close to the preceding one, but the elytra are not trisinuate at the base, as on that species, consequently the shoulders do not clasp the base of the prothorax, their setae are also shorter. Each elytron has two fairly distinct narrow spots at the base, on the third interstice and shoulder, each preapical callosity is fairly well marked with pale scales, but otherwise the mottling on the elytra is very obscure. The rostrum is obscurely diluted with red in front.

Since this description was prepared other specimens, apparently belonging to the species, were obtained from the Solomons (Bougainville, in October, E. O. Pockley; Shortland Island, C. Ribbe); New Georgia (National Museum); and Papua (Mount Lamington, C. T. McNamara). They are slightly larger, up to 8 mm., than the type, the elytral setae are less distinct, on some specimens indistinct even on the apical slope, and on several of them the tooth of the front femora is distinctly larger. Three of them are males, and have the basal segment of abdomen depressed in middle.

MECHISTOCERUS TRIANGULIFER sp. nov.

♂ Black, antennae obscurely reddish. Densely clothed with whitish or greyish scales and setae, each elytron with a large triangle of sooty-brown scales; under surface and legs with whitish scales.

Head with crowded, partly concealed punctures, and with a comparatively small interocular depression. Rostrum about the length of prothorax, rather thin and evenly curved, parallel-sided, except for a slight basal enlargement; basal two-fifths with fine ridges, and coarse, squamiferous punctures, elsewhere with dense and rather coarse, naked punctures. Antennae inserted two-fifths from apex of rostrum, club the length of three preceding joints combined. Prothorax about as long as wide, sides evenly rounded to near apex, which is about half the width of base; with crowded, partly concealed punctures, and a feeble median carina. Elytra elongate, parallel-sided to beyond the middle, base trisinuate, and not much wider than prothorax; with rows of large, deep, suboblong, partly concealed punctures, becoming smaller and rounded posteriorly. Under surface with crowded punctures, those on metasternum and parts of abdomen as large as those on pronotum. Metasternum with a feeble median groove. Basal segment of abdomen feebly depressed in middle, third and fourth

slightly arched, with numerous punctures, their combined length slightly greater than second or fifth. Femora stout, and, especially the hind ones, strongly and acutely dentate. Length, 8·5 mm.

Queensland: Cape York (— Pape). Unique.

A rather dingy species, with markings approaching those of some specimens of *M. calidris*, but elytra narrower, and more parallel-sided, yet less than on *M. vulneratus* and *M. cylindricus* (which have very different clothing). At first glance it appears close to *Camptorrhinus inornatus*. The scales on the upper surface are feebly variegated, but there is a large, ill-defined triangle on each elytron, its side occupying the median third on each side, and its apex touching the suture at the apical third; some of the paler scales have a silvery or coppery gloss. The scales on the pronotum are large, and each fills its containing puncture, it has no suberect setae, but on the elytra there are some setae, indistinct from above, fairly distinct from the sides, and forming a feeble row on each interstice (as seen from behind). When the elytral clothing has been partly abraded the interstices appear to be closely granulate-punctate.

A specimen from Wareo (Rev. L. Wagner), is structurally so close to the type that I think it must belong to the species, but it is much less densely clothed (possibly owing to abrasion), the elytral scales are irregularly mottled from a dingy white to dark brown, with a less defined dark spot on each elytron about the middle.

MECHISTOCERUS TIBIALIS sp. nov.

♂ Black, antennae and claw joints reddish. Upper surface densely clothed with more or less brown scales, each elytron with a short, pale vitta on third interstice at base, each interstice with a suberect row of rather short setae; legs with dense rusty-brown scales and whitish setae; metasternum and abdomen non-squamose, but with a seta in each puncture.

Head with dense, partially concealed punctures in front, base glabrous; with a narrow, deep, interocular impression. Rostrum the length of prothorax, evenly curved, sides gently dilated on basal third; with fine ridges, and coarse, squamiferous punctures on basal half, elsewhere with small, naked punctures. Antennae thin, inserted two-fifths from apex of rostrum, club almost the length of four preceding joints combined. Prothorax almost as long as its greatest width, which is at apical third, where the sides are rather strongly rounded; with crowded, partly concealed punctures and a narrow median carina. Elytra considerably wider than prothorax, rather long, parallel-sided to beyond the middle, base trisinuate, shoulders clasping prothorax; with rows of large, deep, oblong punctures, not very close together on basal half, but becoming smaller and closer

together posteriorly, where (as also on the sides) they are in rather feeble striae; preapical callosities distinct. Metasternum with rather large punctures, but smaller and in a single row on each episternum. Basal segment of abdomen convex, except for a slight median flattening; with comparatively small punctures, except for a basal row of large ones, second to fourth with rather sparse small ones, but crowded on apical segment. Femora stout and acutely dentate, tooth on hind one much larger than the others; tibiae long, thin, and arched at base; front ones conspicuously fringed on apical half; padding of front tarsi longer than on the others. Length, 9 mm.

Buru (— Pape).

With the coarse elytral punctures and spot on each side of base, as on *M. basalis* (from Queensland), but front tibiae of male conspicuously fringed, size larger, and clothing different.

A specimen from Papua (Mount Lamington, C. T. McNamara), is probably a partly abraded female of this species; it is smaller, 7 mm., the elytra much less densely clothed, but with two conspicuous basal spots, basal segment of abdomen more convex, and less of the rostrum with crowded punctures.

MECHISTOCERUS FIMBRITARSIS sp. nov.

♂ Black, some parts obscurely diluted with red, antennae paler. Rather densely clothed with muddy-brown, slightly variegated scales, interspersed with paler, sloping setae.

Head with a narrow, deep, interocular fovea. Rostrum rather long, thin, curved, and parallel-sided, basal half with coarse, partly concealed punctures and a median carina, apical half shining and with fairly dense and small punctures. Antennae inserted slightly nearer apex than base of rostrum. Prothorax moderately transverse, sides feebly dilated from base to beyond the middle, and then strongly rounded; with crowded thimble punctures of moderate size, and a narrow, almost continuous, median carina. Elytra slightly wider than prothorax; with rows of large, deep punctures, becoming smaller, but still fairly large, posteriorly. Two basal segments of abdomen evenly convex, with fairly large and numerous but not crowded punctures, third and fourth each with a single row across middle. Legs moderately long, front femora slightly, middle moderately, hind ones strongly dentate; three basal joints of front tarsi conspicuously fringed. Length, 7–8 mm.

♀ Differs in having the rostrum slightly longer, thinner, less clothed and with smaller punctures, and front tarsi not fringed.

North Western Australia; North Australia: Darwin (Macleay Museum), King River, in December (W. McLennan). Types in Macleay Museum, cotypes in National and South Australian Museums.

A dingy species, in general appearance like *M. maculibasis* and several others from New Guinea, but distinct by the fimbriated front tarsi of the male. The four specimens examined are all rather dingy, on two of then there are two feeble spots at the base of the elytra, as on many New Guinea species; the femora are feebly ringed with darker scales. There are some small granules on the elytra, but they are normally concealed; Where the clothing has been abraded the punctures are seen to be much larger than those on the prothorax, except posteriorly.

MECHISTOCERUS DENTIVARIUS sp. nov.

♂ Black, parts of legs obscurely diluted with red, antennae reddish. Rather sparsely clothed with dark brown scales, the elytra with a thin irregular fascia of whitish scales crowning the apical slope, and a few feeble spots elsewhere, in addition with stout sloping setae, rather numerous on the legs, and forming a single row on each elytral interstice.

Head with a small, deep, triangular, interocular fovea. Rostrum long, thin, curved and parallel-sided from near the base; basal third with crowded, partly concealed punctures, and a median carina, elsewhere shining and with small punctures. Prothorax slightly transverse, sides obliquely increasing in width to near apex, and then strongly narrowed; with dense thimble punctures of moderate size, and a narrow median carina. Elytra distinctly wider than base of prothorax; with rows of large, deep, angular punctures, becoming smaller, but still fairly large, posteriorly. Basal segment of abdomen widely and shallowly depressed; with large punctures at base, ranging to small at apex, fairly large ones on second, a single row across middle of each of the third and fourth. Front femora slightly, middle moderately, hind ones strongly dentate. Length, 5–6 mm.

♀ Differs in having rostrum silghtly longer, thinner, less clothed and with smaller punctures, and basal segment of abdomen rather strongly convex.

Torres Straits: Moa Island, in January to light (W. McLennan); male, K. 47865, in Australian Museum; Queensland (Fry Collection, 51471), female, in British Museum.

A small species, about the size of *M. duplicatus*, but with sharply defined punctures and much smaller femoral teeth; it is more robust than *M. cancellatus*, and the front femora are almost edentate. From above it has the appearance of several species of *Tyrtaeosus*, but the pectoral canal is that of *Mechistocerus*. On the male there are some rust-coloured setae that form a T on the pronotum, due to being rather dense at the apex and overlapping, and partly concealing, the median carina; from the female most of the setae have been abraded; the latter has the abdomen somewhat reddish, probably from immaturity.

MECHISTOCERUS BIVITTIPENNIS sp. nov.

Black, parts of rostrum and of legs obscurely diluted with red, antennae rather pale red. Densely clothed with two shades of brown scales and setae, prothorax and under surface with setae only, legs with light brown scales and white setae.

Head with a large, deep, semidouble, interocular fovea. Rostrum long, thin, and slightly dilated at base, about which the punctures are dense and strong, elsewhere shining and scarcely visibly punctate. Antennae inserted about two-fifths from apex of rostrum. Prothorax moderately transverse, sides rather strongly rounded; with dense thimble punctures of moderate size, and a narrow median carina. Elytra distinctly wider than prothorax; with rows of large, angular punctures, becoming much smaller posteriorly, interstices with numerous small granules about base, sparse elsewhere. Abdomen with numerous punctures, except that each of the third and fourth segments has a single setiferous row. Legs rather long, all femora strongly and acutely dentate, tibiae thin and compressed. Length, 8–9 mm.

New Guinea: Wareo (Rev. L. Wagner).

On the pronotum the paler setae form a distinct median line, and a feeble one towards each side, on each elytron the paler spots are fairly numerous and feeble, but there is a distinct one on the preapical callus, there is also a narrow, distinct, slightly oblique vitta, on the third interstice from the base to near the middle, which renders the species a very distinct one, although it is but an extension of a basal spot that occurs on so many species of the genus. The basal segments of abdomen are rather strongly convex, so the two specimens examined are probably females.

MECHISTOCERUS URSUS sp. nov.

Black, antennae obscurely reddish. Densely clothed with dark, muddy-brown scales, variegated with whitish on elytra; in addition with rather dense suberect or sloping setae, mostly rusty-brown on upper surface, mostly whitish on under surface and legs.

Head with a rather narrow, subtriangular, interocular fovea. Rostrum slightly longer than prothorax, moderately curved, somewhat dilated towards and notched on each side of base, about base with crowded, partly concealed punctures, elsewhere shining and with small ones. Antennae inserted about two-fifths from apex of rostrum. Prothorax rather small, slightly transverse, sides strongly rounded; with dense, concealed punctures. Elytra distinctly wider than prothorax, parallel-sided to beyond the middle; with rows of large, deep, angular punctures, mostly concealed by clothing. Two basal segments of abdomen evenly

convex, third and fourth each with two irregular rows of punctures across middle, and crowded on sides. Femora stout, strongly and acutely dentate, especially the hind pair, tibiae rather long and compressed. Length, 7–8 mm.

Papua: Mount Lamington (C. T. McNamara).

With unusually dense scales and setae, concealing most of the punctures of the upper surface, even many of the large ones on the basal half of elytra. On the elytra the pale scales form numerous feeble spots, with an ill-defined fascia crowning the apical slope. Although, when viewed from behind, the elytral setae are seen to be placed in a single row on each interstice, they are so close together that on slight disarrangement they appear from above to be irregularly crowded. The species is not very close to any other before me. The two specimens taken appear to be females.

MECHISTOCERUS UNIFORMIS sp. nov.

♀ Black, rostrum and parts of legs obscurely diluted with red, antennae paler. Densely clothed with small, rusty-brown scales, interspersed with short, sloping setae; under surface sparsely clothed.

Head with a narrow, deep, interocular fovea. Rostrum slightly longer than prothorax, moderately thin, sides somewhat dilated towards base, each side of which is notched; about base with coarse, partly concealed punctures, and a short median carina, elsewhere shining and almost impunctate. Antennae inserted slightly nearer base than apex of rostrum. Prothorax moderately transverse, basal half parallel-sided; with crowded punctures and a fine median carina traceable through clothing. Elytra conspicuously wider than prothorax; with rows of large, deep, angular punctures, becoming smaller posteriorly. Basal segment of abdomen evenly convex; with large punctures, becoming smaller posteriorly, third and fourth segments each with an irregular transverse row of small, setiferous punctures. Femora stout, strongly and acutely dentate, especially the hind pair. Length, 5 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

Not very close to any other species before me. The clothing has a curious velvety appearance; although the derm of the upper surface is entirely concealed by them, the individual scales are so small, that the punctures, except some of the smaller ones, are clearly traceable. The setae are unusually short, but being of a slightly different shade from the scales amongst which they are set, they are fairly distinct.

MECHISTOCERUS PARVICOLLIS sp. nov.

♂ Black, antennae and tarsi obscurely reddish. Densely clothed with rusty-brown and whitish scales and setae.

Head with a narrow, deep, interocular fovea. Rostrum slightly longer than prothorax, not very thin, almost parallel-sided; with crowded punctures, becoming larger and partly concealed on basal half, with a continuous median carina and two shorter ones on each side. Antennae inserted about two-fifths from apex of rostrum. Prothorax small, almost as long as wide, basal half parallel-sided; with dense punctures of moderate size, and with a fine median carina. Elytra much wider than prothorax, parallel-sided to beyond the middle; with rows of deep, more or less oblong punctures, each containing a seta. Basal segment of abdomen flattened in middle. Femora strongly and acutely dentate, tibiae long, thin, and compressed. Length, 8 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

The type is in perfect condition, and the species is distinct from all previously described Australasian ones by its small prothorax, this being scarce three-fifths the width of the base of elytra. The pale scales on the elytra form numerous spots and abbreviated fasciae, on the prothorax they form a median line, and a less distinct one on each side; on the legs the scales are of a rather pale brown, and the setae are pure white; on the under surface there are no depressed scales, but the setae are fairly numerous, and on each of the third and fourth segments of abdomen they form two transverse rows.

MECHISTOCERUS MACULOSUS sp. nov.

Black, antennae and tarsi reddish. Densely clothed with slaty-brown and whitish scales and setae.

Head with a narrow, deep, interocular fovea. Rostrum slightly longer than prothorax, not very thin, notched on each side of base; basal half with crowded and usually concealed punctures, and a narrow median carina, elsewhere shining and with small punctures. Antennae inserted about one-third from apex of rostrum. Prothorax moderately transverse, basal two-thirds parallel-sided; with dense, partly concealed thimble punctures of moderate size, and with a narrow, concealed median carina. Elytra not much wider than prothorax; with rows of large, deep, oblong punctures, becoming smaller posteriorly. Two basal segments of abdomen rather strongly convex, and with numerous punctures of moderate size. Femora strongly and acutely dentate, especially the hind pair, tibiae rather long and thin. Length, 4·5 mm.

Papua: Buna Bay (C. T. McNamara). Unique.

About the size of *M. egenus,* from Queensland, but clothing paler, rostrum stouter, and femoral dentition stronger; at first glance it looks like a densely clothed specimen of *M. trisinuatus,* from the Malay Peninsula, but the clothing and dentition are different. On the elytra the whitish scales form numerous irregularly distributed spots, including four at the base, which occupy about

one-third of the surface; on the pronotum they form a narrow median line, and irregular spots on the sides; on the legs the clothing is mostly whitish; on the under surface there are no scales, but the whitish setae are numerous, except on the third and fourth segments of abdomen, on each of which they form a transverse row. On the elytra there is a regular row of stout, white, sloping setae, on each interstice. The sex of the type is doubtful; the coarse punctures occupy more of the rostrum than is usual on females, and the front tarsi have some straggling hairs, although they are not distinctly fimbriated; but the basal segment of abdomen is evenly convex.

MECHISTOCERUS ATRONITIDUS sp. nov.

Black, shining, antennae bright castaneous. Under surface and legs with sparse, whitish setae, elsewhere glabrous, except for a few setae on apical slope of elytra.

Head with a narrow, deep, interocular fovea. Rostrum slightly longer than prothorax, moderately thin; with rather dense and coarse punctures about base, minute elsewhere. Prothorax moderately transverse, basal half parallel-sided; with dense but not crowded punctures of moderate size. Elytra oblong-cordate, not much wider than prothorax; with large, deep, oblong punctures about base, much smaller elsewhere. Metasternum deeply sulcate in middle. Abdomen with sparse and small punctures, but rather dense and of moderate size on apical segment; basal segment gently convex. Front femora slightly but acutely dentate, middle moderately, hind ones strongly and acutely; tibiae thin, the hind ones strongly arched at basal third. Length, 3·5–4·0 mm.

Papua: Mount Lamington (C. T. McNamara).

A small species about the size of *M. trisinuatus,* but otherwise very different; at first glance it appears to belong to the Baridiinae. The hind tibiae are unusually strongly and suddenly arched, and the teeth of the hind femora are larger than on most species of the genus. Four specimens were obtained by Mr. McNamara; they differ to a slight extent in the abdomen and rostrum, but as the curvature of the hind tibiae is alike on all of them they appear to be of one sex, probably males. They are all shining and glabrous on the upper surface, so the absence of clothing is evidently not due to abrasion. A specimen from Finsch Haven, taken by Rev. L. Wagner, on sticky hairs of a species of *Pisonia,* is smaller (3 mm.), and has somewhat stronger punctures on the under surface, but appears to belong to the same species.

MECHISTOCERUS CALIDRIS Pasc.

Four specimens, from the Solomons, differ from others from Australia and New Guinea, in having the paler scales of a more reddish tone than usual.

MECHISTOCERUS MULTIMACULATUS Lea.

This species occurs in Papua (Mount Lamington), and New Guinea (Finsch Haven and Bongu), as well as in Queensland.

MECHISTOCERUS ATOMOSPARSUS Fairm.

(formerly *Cyamobolus*), 1878. *M. languidus* Lea, 1905.

A specimen in the National Museum, from the Godeffroy collection, is labelled *Cyamobolus atomosparsus,* and bears the number 16015. It was evidently from Fiji, and bears the same number as another species from there, which is labelled *Mecistocerus ocellatolineatus* (in error for *ocellolineatus*). It appears to be correctly named, although the type was described as having *"cinereo-carneis"* scales, and again *"pedibus dense cinerea-carneo squamulosis."* In all the many specimens before me the scales are not at all red, being greyish, or pale brown, or slightly mottled. The front legs of the male are long and thin, the tibiae with a long fringe of golden hairs continued on to the tarsi; the front tibiae were not mentioned in the original description of *atomosparsus,* which reads as if founded upon a female. Fairmaire considered the species could not be referred to *Mechistocerus,* on account of the rostral canal, but this is margined, behind the front coxae, by walls which belong to the prosternum, instead of the mesosternum (to see this clearly it is sometimes necessary to detach the prosternum from the mesosternum); a character almost unique in the subfamily. The species is common in Fiji (Viti Levu, Vanua Levu, and Ovalau), where it often comes into houses. It also occurs in New Guinea, Aru, Queensland, New South Wales, and Labuan.

Unfortunately I described the species as *M. languidus,* which name must now be treated as a synonym. I have also seen a specimen, from New Guinea, identified by Dr. K. M. Heller as belonging to *Parendymia.*

MECHISTOCERUS MAGNIDENS Lea.

Specimens of this species have been reared from sapwood of the Queensland walnut, *Endiandra Palmerstoni,* at Cairns.

FAMILY CERAMBYCIDAE.

XIXUTHRUS HEROS Heer.

Fig. 2.

There are two specimens of this huge Fijian longicorn in the South Australian Museum from Viti Levu; the male 125 mm. in length, the female 90 mm.; the former taken by Mr. C. T. McNamara in June, the latter by Dr. Baly in July.

NAT.MUS.MELB.

Fig. 2. *Xixuthrus heros* Heer. Natural size. *Photo, B. Cotton.*

MICROTRAGUS SENEX White.

Mrs. Daisy Bates, of Ooldea, writes that she has two aboriginal names for this species: "Kardilga" and "Miring."

NATIONAL MUSEUM
VICTORIA.

ARTHUR MILLS LEA, F.E.S.

Entomologist to South Australian Museum, July, 1911–February, 1932.

NATIONAL MUSEUM VICTORIA

OBITUARY AND BIBLIOGRAPHY
OF ARTHUR MILLS LEA

By HERBERT M. HALE, Director, South Australian Museum.

On February 29, 1932, Arthur Mills Lea passed away with tragic suddenness when visiting a friend near Adelaide; an hour before he had called at the Museum, and was then apparently in the best of health. His loss is irreparable, for not only was he in the van of systematic entomology, but was very widely consulted for his knowledge of insects harmful to man and his works.

Mr. Lea was born near Sydney in August, 1868. He commenced his official career in 1891, when he joined the Department of Agriculture in New South Wales. Working as Assistant Entomologist to the late A. Sidney Oliff (then Government Entomologist of that State), he travelled over many parts of New South Wales, studying especially the insects adversely affecting potatoes, tobacco, and citrus fruits. At this time the citrus orchards of California were threatened with destruction by an Australian pest, the "cottony cushion scale"; with Dr. Koebele, a visiting American entomologist, Mr. Lea collected thousands of living specimens of a small species of ladybird which feeds on the "scale insect." The little beetles were duly released in the American orchards, and controlled the pest within two years. In 1895 he was appointed Government Entomologist of Western Australia, and for four years his work was concerned mainly with the principal pests of plants. He accepted a similar position in Tasmania in 1899, and there continued to carry out useful research on the insect pests of fruit. He was instrumental in the stamping out of two outbreaks of Mediterranean fruit fly which occurred there during his twelve years of office. Also, during this period he sent several consignments of useful living insects to England, South Africa, and the United States, and on several occasions visited Victoria and New South Wales in order to study Interstate pests at first hand. He was a foundation member of the Tasmanian Field Naturalists' Club, and the first Editor of "The Tasmanian Naturalist." In 1911 he became Entomologist to the South Australian Museum, and when he died had almost completed twenty-one years of service in that capacity. When Mr. Lea came to this Museum our entomological collection was relatively small; at the present time it includes one million specimens, and will always stand as a monument for his two decades of zealous service and untiring effort. Prior to

his appointment in South Australia he had made full use of every opportunity to collect, classify, and describe Coleoptera, particularly the weevils, which are intimately connected with vegetation. In our State he continued this work with such enthusiasm that the South Australian Museum now possesses an unrivalled collection of Australasian beetles, and will for long remain the centre of research in the Southern Hemisphere for this group. Further, Mr. Lea enhanced the value of this collection exceedingly by describing an amazing number of new species. His ambition at one time was to erect 5,000 species, but when he died he had described approximately 5,500—an unrivalled feat.

Much of the material added to the collection was taken by Mr. Lea in person during this last phase of his career. Apart from collecting in many parts of South Australia, he made the following official trips to other States: New South Wales and Queensland (December 1911, to April, 1912), Lord Howe and Norfolk Islands (November, 1915, to February, 1916), Tasmania (January to February, 1918), New South Wales and Queensland (September to December, 1918), New South Wales (October to November, 1926), and Victoria, New South Wales, and Queensland (October to November, 1928).

He also had an enviable knack of imbuing others with his enthusiasm, and, as a result, material is constantly coming in from all over Australasia. His instructions regarding the collecting of insects were always minute; one may mention, for instance, that for the guidance of each collector in New Guinea he prepared twelve pages of typescript.

The growing Museum collections soon had a foremost place in Mr. Lea's thoughts. In 1924 he was asked to join the permanent staff of the Department of Agriculture in Fiji, but declined on account of this absorbing interest. Nevertheless, as detailed below, he spent twelve months as a temporary officer of that department when investigating the Coconut moth. On the eve of his departure for Fiji the staff gathered to wish him God-speed, and after expressing his regret at leaving the Museum for a year, he stated that he hoped that he would return to work at the collections for as long as he lived. On several occasions he repeated that his earnest desire was to work on these collections (amassed as a result of his efforts and recommendations) as long as he was capable, and that he would wish then to die "in harness." In these respects his desires are fulfilled, but one cannot help but think, prematurely.

In South Australia, Mr. Lea's knowledge of economic entomology continued to be of the greatest service to farmers, orchardists, and hosts of others. For a time he was Lecturer in Forest Entomology at the University of Adelaide; for many years he lectured to all graduating school teachers, and was Con-

sulting Entomologist to the Department of Agriculture, which frequently requested him to investigate destructive insects. One has often been astounded at the amount of correspondence which passed through his hands, the number of queries which he attended to each day, and the quantity of specimens identified. He had no idle moments, and so regulated his unremitting labours that daylight hours, as far as possible, were utilized for close examination of material, while his evenings were taken up in preparing manuscript for publication, and in other occupations upon which he preferred not to spend any part of the day.

In 1918-1919 he played an important part in the campaign against the insect pests in the vast quantities of wheat, which, owing to the war, had accumulated in Australia. He was a member of the Wheat Weevil Committee, which devised three practical systems of treatment, which resulted in the saving of wheat worth at least £1,500,000. The weevil was recognized as a pest which was encouraged by dirty conditions, and the chief problem in regard to storage was to prevent contamination from without, and to secure "gas-tight" conditions to allow for efficient fumigation. The most successful measure for both purposes proved to be the use of malthoid sheds, which were first tried at the suggestion of Mr. Lea. His directions regarding means of preventing the spread of the trouble, and methods of removing breeding grounds in the vicinity of and under the stacks, were also of the greatest value.

One of the most important of his expeditions was carried out in 1924, on behalf of the Levuana Committee, when he spent a year on a mission to Queensland, Thursday Island, Java, Malaya, and Borneo, in order to study methods of controlling the Coconut Moth *(Levuana iridescens)*, which was then threatening the destruction of the copra industry in Fiji. The importance of his work in this direction has been submerged in the reports of following investigations. He found that a Tachinid fly was controlling a similar pest *(Artona catoxantha)* in Malay and Java, and, after consultation with Mr. J. A. Despeissis, then Superintendent of Agriculture in Fiji, he attempted to introduce this control. He realized the importance of rapid transport, and suggested that a consignment be sent by aeroplane to meet his boat at the Torres Straits. The British Government, however, could not then make the necessary arrangements, so that he was enabled only to bring some of the flies as far as Sydney in cold storage; the experiment proved unsuccessful. A few days later his engagement by the Committee terminated. Subsequently the fly was transported rapidly to Fiji, where it quickly spread, controlling the Levuana moth, as Mr. Lea had predicted it would.

As already mentioned, and as shown by the accompanying Bibliography, Mr. Lea was a prolific writer. He belonged to a number of scientific societies, and submitted papers to almost all of them. At the time of his death he was a Fellow of the Linnean Society of New South Wales (1892), Fellow of the Royal Society of South Australia (1897), a Fellow of the Entomological Society of London (1899), a Member of the Entomological Society of Belgium (1906), a Member of the American Association of Economic Entomologists (prior to 1908), a Fellow of the Royal Society of Victoria (1909), an Associate Member of the Royal Society of Tasmania (1910), and had just become a Member of the Zoological Society of New South Wales.

At almost every meeting of the Royal Society of South Australia held during the last twenty years entomological exhibits of interest have been tabled, and short, characteristic talks concerning them have been given by Mr. Lea. He occupied a position on the Council of that Society for nine years, and assisted in the editing of the "Transactions" for seven years. In the last-mentioned capacity he actually spent many evenings personally typing some of the handwritten entomological papers which were submitted for publication.

Mr. Lea's copious additions to entomological literature alone stand as a remarkable record of the life-work of a single individual, while his painstaking efforts in regard to every problem submitted to him will be missed sadly all over the world. Apart from this his genial disposition endeared him to all who came into contact with him, and his passing will remain a personal grief to all who were thus privileged. The Board and the staff of the Museum, Mr. Lea's associates in learned societies, and all his other colleagues in Australia, not only esteemed him for his sterling qualities, but regarded him with sincere affection.

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163. Australian and Tasmanian Pselaphidae (Coleoptera). *Proc. Linn. Soc., N.S. Wales,* xxxv, 1910, pp. 691-772, pl. xxi.

165. Australian and Tasmanian Coleoptera Inhabiting or Resorting to the Nests of Ants, Bees, and Termites. *Proc. Roy. Soc., Vic.,* xxiii (new series), 1910, pp. 116-230, pl. xxv-xxvii.

164. On some Pselaphidae of the Howitt Collection. *Proc. Roy. Soc., Vic.,* xxiii (new series), 1910, pp. 8-14.

166. Notes on the Genus *Lissotes*, with Descriptions of New Species. *Papers and Proc. Roy. Soc., Tas.,* 1910, pp. 346-366, pl. viii-ix.

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170. On Some Tasmanian Cave-inhabiting Beetles. *Tas. Nat.,* ii, 3, 1910, pp. 53-58.

171. Guests of Ants, Bees, and Termites. *Vic. Nat.,* xxvii, 1910, pp. 50-56.

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174. Notes on Australian Curculionidae in the Belgium Museum, with Descriptions of New Species, Part ii. *Mém. de la Soc. Ent. de Belgique,* xviii, 1911, pp. 61-128.

175. Descriptions of Australian Curculionidae, with Notes on Previously Described Species, Part ix. *Trans. Roy Soc., S. Austr.*, xxxv, 1911, pp. 62-88.

176. Descriptions of New Species of Australian Coleoptera, Part ix. *Proc. Linn. Soc., N.S. Wales,* xxxvi, 1911, pp. 426-478, pl. xvii.

177. On a New Australian Genus of Phoridae Associated with Termites. *Proc. Roy. Soc., Vic.,* xxiv (new series), 1911, pp. 76-77, pl. xxiv.

178. Barley Grub. *Agric. Gaz., Tas.,* xix, 1911, pp. 17-21.

179. Delayed Emergence of Codlin Moth. *Agric. Gaz., Tas.,* xix, 1911, p. 24.

181. Irish Blight. *Agric. Gaz., Tas.,* xix, 1911, pp. 357-371; also *Dept. Agric. and Stock, Tas., Bull.* 24, 1911, pp. 1-20 (15 fig.).

180. Minute but Useful Ladybird Beetle. *Agric. Gaz., Tas.,* xix, 1911, p. 65.

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183. Descriptions of Australian Curculionidae, with Notes on Previously Described Species, Part x. *Trans. Roy. Soc., S. Austr.,* xxxvi, 1912, pp. 76-139.

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187. Notes on Cryptorhynchides (Coleoptera, Curculionidae) in the South Australian Museum, with Descriptions of New Species. *Trans. Roy. Soc., S. Austr.,* xxxvii, 1913, pp. 182-300.

188. Descriptions of Australian Curculionidae, with Notes on Previously Described Species, Part xi. *Trans. Roy. Soc., S. Austr.,* xxxvii, 1913, pp. 301-445.

189. Revision of the Australian Curculionidae belonging to the subfamily Cryptorhynchides (Coleoptera), Part xii. *Proc. Linn. Soc., N.S. Wales,* xxxviii, 1913, pp. 451-489.

190. On Australian and Tasmanian Coleoptera, with Descriptions of New Species, Part ii. *Proc. Roy. Soc., Vic.*, xxvi (new series), 1913, pp. 211-225, pl. xxii.

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193. Scientific Notes on an Expedition into the Interior of Australia, carried out by Captain S. A. White, M.B.O.U., from July to October, 1913. (*d*) Stomach Contents of Birds. *Trans. Roy. Soc., S. Austr.*, xxxviii, 1914, pp. 439-440.

194. Scientific Notes on an Expedition into the Interior of Australia, carried out by Captain S. A. White, M.B.O.U., from July to October, 1913. (*j*) Insecta: Coleoptera. *Trans. Roy. Soc., S. Austr.*, xxxviii, 1914, pp. 448-454.

195. Descriptions of New Species of Australian Coleoptera, Part x. *Proc. Linn. Soc., N.S. Wales*, xxxix, 1914, pp. 650-694, pl. lxxvi.

196. Notes on Australian and Tasmanian Scydmaenidae, with Descriptions of New Species. *Proc. Roy. Soc., Vic.*, xxvii (new series), 1914, pp. 198-231.

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199. An Insect-catching Grass. *Trans. Roy. Soc., S. Austr.*, xxxix, 1915, pp. 92-93, pl. ix.

200. Notes on Australian Eumolpides (Coleoptera: Chrysomelidae), with Descriptions of New Species. *Trans. Roy. Soc., S. Austr.*, xxxix, 1915, pp. 102-339, pl. v-viii.

201. Scientific Notes on an Expedition into the North-western Regions of South Australia. (*e*) Stomach contents of Birds. *Trans. Roy. Soc., S. Austr.*, xxxix, 1915, pp. 760-766.

202. Scientific Notes on an Expedition into the North-western Regions of South Australia. (*i*) Insecta: Coleoptera. *Trans. Roy. Soc., S. Austr.*, xxxix, 1915, pp. 793-801.

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209. Results of the South Australian Museum Expedition to Strzelecki and Cooper Creeks, September and October, 1916. (*n*) Insecta. *Trans. Roy. Soc., S. Austr.,* xli, 1917, pp. 489-630, pl. xxxiii-xxxvii.

210. Descriptions of New Species of Australian Coleoptera, Part xiii. *Proc. Linn. Soc., N.S. Wales,* xlii, 1917, pp. 545-582, pl. xxix.

1918.

211. On Australian Coleoptera, Part i. *Rec. S. Austr. Mus.,* i, 1918, pp. 83-104, pl. ix.

212. Notes on Some Miscellaneous Coleoptera, with Descriptions of New Species, Part iv. *Trans. Roy. Soc., S. Austr.,* xlii, 1918, pp. 240-275, pl. xxx-xxxii.

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214. Notes on Some Miscellaneous Coleoptera, with Descriptions of New Species, Part v. *Trans. Roy. Soc., S. Austr.,* xliii, 1919, pp. 166-261, pl. xxv-xxvii.

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217. On Australian Coleoptera, Part ii. *Rec. S. Austr. Mus.*, i, 1920, pp. 273-290, pl. xxxii.

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223. On Australian Coleoptera of the family Malacodermidae. *Trans. Roy. Soc., S. Austr.*, xlv, 1921, pp. 50-135.

224. Descriptions of New Species of Australian Coleoptera, Part xvii. *Proc. Linn. Soc., N.S. Wales*, xlvi, 1921, pp. 351-369 (one text figure).

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234. On Australian Staphylinidae (Coleoptera), Part 1. *Trans. Roy. Soc., S. Austr.*, xlvii, 1923, pp. 1-53.

235. Flora and Fauna of Nuyt's Archipelago and the Investigator Group, No. 11, The Coleoptera of Pearson Is. *Trans. Roy. Soc., S. Austr.*, xlvii, 1923, pp. 355-360, pl. xxxi.

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244. Australian Species of *Aulacophora* (Coleoptera, Chrysomelidae). *Mem. Qld. Mus.*, viii, 1924, pp. 45-52.

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248. Notes on some Calcareous Insect Puparia. *Rec. S. Austr. Mus.*, iii, 1925, pp. 35-36, pl. i.

249. On Australian Staphylinidae (Coleoptera), Part ii. *Trans. Roy. Soc., S. Austr.*, xlix, 1925, pp. 213-253.

250. Descriptions of New Species of Australian Coleoptera, Part xviii. *Proc. Linn. Soc., N.S. Wales*, l, 1925, pp. 414-431.

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255. On some Australian Curculionidae. *Proc. Linn. Soc., N.S. Wales*, li, 1926, pp. 327-362.

256. Australian Curculionidae of the subfamily Gonipterides. *Proc. Roy. Soc., Vic.*, xxxix (new series), 1926, pp. 76-112.

257. Black Cicada or Red-eye (*Psaltoda moerens* Germ.). *S. Austr. Nat.*, vii, 1926, pp. 39-41, fig. 1-8 (plate).

1927.

258. On Two New Species of Otiorhynchini from Australia *in* Wissenschaftliche Ergebnisse der Bearbeitung der Coleopteren—Sammlung von Franklin Muller (Bietrag iv). *Entomologische Mitteilungen*, xvi, 2, 1927, pp. 129-130.

259. Descriptions of New Staphylinidae from Fiji. *Rec. S. Austr. Mus.*, iii, 1927, pp. 273-278.

260. On a New Genus of Water-beetles (Dytiscidae). *Rec. S. Austr. Mus.*, iii, 1927, pp. 279-281, fig. 106.

261. On New Species of *Emplesis* (Curculionidae). *Trans. Roy. Soc., S. Austr.*, li, 1927, pp. 93-122.

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263. Descriptions of New Species of Australian Coleoptera, Part xix. *Proc. Linn. Soc., N.S. Wales*, lii, 1927, pp. 354-377.

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265. South Australian Plant Weevils. *Journ. Agric., S. Austr.,* xxx, 1927, pp. 582-598.

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267. Australian Curculionidae of the subfamilies Haplonycides and Cryptorhynchides. *Trans. Roy. Soc., S. Austr.,* lii, 1928, pp. 95-164, pl. vii-ix.

268. New Species of Australian Erirhinides (Curculionidae). *Proc. Linn. Soc., N.S. Wales,* liii, 1928, pp. 375-396.

269. Cotton Bollworm in South Australia. *Journ. Agric., S. Austr.,* xxxi, 1928, pp. 608-615.

1929.

270. Notes on the Coleopterous genus *Ampagia* (Curculionidae), with Descriptions of New Species. *Trans. Ent. Soc., London,* 1929, pp. 185-194, pl. xvi.

271. Notes on some Miscellaneous Coleoptera, with Descriptions of New Species, Part vii. *Trans. Roy. Soc., S. Austr.,* liii, 1929, pp. 203-244 (5 text fig.).

272. Descriptions of New Species of Australian Coleoptera, Part xx. *Proc. Linn. Soc., N.S. Wales,* liv, 1929, pp. 519-549 (8 text fig.).

273. On Coleoptera, mostly from Queensland. *Mem. Qld. Mus.,* ix, 1929, pp. 335-363.

1930.

274. On Australian Coleoptera, Part vi. *Rec. S. Austr. Mus.,* iv, 1930, pp. 243-273, fig. 1.

275. On some Coleoptera from Northern Australia, Collected by Dr. H. Basedow. *Trans. Roy. Soc., S. Austr.,* liv, 1930, pp. 148-154 (1 text fig.).

276. Descriptions of New Species of Australian Coleoptera, Part xxi. *Proc. Linn. Soc., N.S. Wales,* lv, 1930, pp. 451-467.

1931.

277. On some Mordellidae from New Guinea and Fiji. *Trans. Ent. Soc., London,* lxxix, 1931, pp. 311-321 (21 text fig.).

278. Australasian Coleoptera. *Rec. S. Austr. Mus.,* iv, 1931, pp. 365-408, fig. 1-2.

279. Notes on some Miscellaneous Coleoptera, with Descriptions of New Species, Part viii. *Trans. Roy. Soc., S. Austr.,* lv, 1931, pp. 39-54 (32 text fig.).

280. On Baridiinae (Curculionidae), mostly from New Guinea. *Proc. Linn. Soc., N.S. Wales,* lvi, 1931, pp. 139-171 (37 text fig.).

1932.

281. Phalacridae (Coleoptera) of Australia and New Guinea. *Rec. S. Austr. Mus.,* iv, 1932, pp. 433-481, fig. 1-140.

The PHALACRIDAE (COLEOPTERA) of AUSTRALIA and NEW GUINEA

By the late ARTHUR M. LEA, F.E.S.

Fig. 1-140.

The family Phalacridae is abundantly represented in Australia and New Guinea, although comparatively few species have been recorded from the former country and not one from the latter. It has also not been recorded from Fiji or New Zealand. Major Broun apparently had no specimen of it from the latter country, and Mr. A. E. Brookes writes that it is unknown to him from there also, even *Phalacrus fimetarius* apparently not yet having been introduced.

In Masters' Catalogue only one species of the family, *Litochrus brunneus* Er., was recorded as Australian; a few records were made by Champion and Guillebeau, but most of the species were named by Blackburn, in the Transactions of the Royal Society of South Australia for 1891 (including notes on the family), 1892, 1893, 1895 (including notes on the family and a table of genera), 1899, 1902, and 1903. In Junk's Coleopterorum Catalogue, Part 108, A. Hetschko deals with the family from all parts of the world. Many additional localities and some synonymy can now be recorded, but the previous Australian records (all of Blackburn's are from the Transactions quoted) are as follows:

Phalacrus Payk., Fauna Suec., III, 1800, p. 438; Cat., p. 4.

burrundiensis Blackb., 1891, p. 101; Champ., Ent. Mo. Mag., LX, 1924, p. 237, Ann. Mag. Nat. Hist. (9), xv, 1925, p. 39. N.A.

lineopunctatus Guilleb., Ann. Soc. Ent. Belg., xxxviii, 1894, p. 458; Cat., p. 5. India, Java, and Burmah.

fimetarius F., Syst. Ent., 1775, p. 68. Europe, Africa, Asia.

corruscus Panz., Fauna Germ., 1797, No. 10; Blackb., 1891, p. 100. S.A., V.

(*corvinus* Guilleb., recorded by Champion, Ent. Mo. Mag., 1924, p. 237, as Australian, was later, Ann. and Mag. Nat. Hist., 1925, xvi (9), p. 605, noted as not Australian.)

(*uniformis* described by Blackburn as a *Litochrus* and removed to *Parasemus*, was recorded by Champion, under the erroneous name of *unicolor*, as a *Phalacrus*.)

PHALACRINUS Blackb., 1891, p. 99, table, 1902, p. 298; Guilleb., Ann. Soc. Ent. Fr., 1895, Bull., p. xxvi; Cat., p. 12.

AUSTRALIS Blackb., 1891, p. 99; Guilleb., *l.c.* S.A.
COMIS Blackb., 1895, p. 215, 1902, p. 298. V., T.
COMPRESSUS Blackb., 1902, p. 297. N.S.W.
NAVICULARIS Blackb., 1902, p. 298. V.
NOTABILIS Blackb., 1895, p. 214. Q.
var. *dilutior* Blackb., *l.c.*, p. 215. Q.
OBTUSUS Blackb., 1891, p. 100; Guilleb., *l.c.*: Champ., Ann. Mag. Nat. Hist., (9), xv, 1925, p. 36, fig. 1, d.e. S.A.
ROTUNDUS Blackb., 1891, p. 100; Guilleb., *l.c.* S.A.
UMBRATUS Blackb., 1902, p. 297. N.S.W., W.A.

LITOCHRUS Er., Naturg. Ins. Deutsch., 1845, p. 108; Blackb., tables, 1895, p. 209, 1902, p. 294; Cat., p. 15.

ALTERNANS Blackb., 1891, p. 95. V.
BACCAEFORMIS Blackb., 1902, p. 293. N.S.W.
BRUNNEUS Er. *(Phalacrus)*, Wiegm. Arch., 1842, p. 239; Blackb., 1891, p. 94, 1895, p. 206, 1902, p. 293; Guilleb., Ann. Soc. Ent. Fr., 1894, p. 295. T.
COLORATUS Blackb., 1895, p. 207, 1902, p. 293. Q.
CONSORS Blackb., 1893, p. 295. Q.
FRIGIDUS Blackb., 1891, p. 97. V.
KOEBELEI Blackb., 1895, p. 208. N.S.W.
LAETICULUS Blackb., 1891, p. 95. V.
LAUTUS Blackb., 1902, p. 290. N.S.W.
MACULATUS Blackb., 1891, p. 96. S.A.
MAJOR Blackb., 1891, p. 97, 1895, p. 208. S.A.
MARITIMUS Blackb., 1903, p. 111. V.
OBSCURICOLLIS Blackb., 1902, p. 292. N.S.W.
PALMERSTONI Blackb., 1891, p. 95. N.A.
PERPARVUS Blackb., 1902, p. 291. V.
PLAGIATUS Blackb., 1902, p. 289. N.S.W.
SPARSUS Blackb., 1902, p. 290. V.
SYDNEYENSIS Blackb., 1892, p. 26. N.S.W.
TINCTUS Blackb., 1895, p. 208. Q.

MEROBRACHUS Guilleb., Ann. Soc. Ent. Fr., lxiv, 1895; Bull. p. xxvi; Cat., p. 16.

AMABILIS Guilleb., *l.c.*, 1894, p. 296 *(Micromerus)*; Blackb., 1902, p. 293. Australia.

HETEROLITUS Guilleb., Ann. Soc. Ent. Fr., 1893, p. 275, 1894, p. 280; Cat., p. 17.

THORACICUS Fleut., 1887, p. 61 *(Olibrus)*, 1893, p. 376. India, etc.

var. *noteroides* Blackb. *(Litochrus)*, 1895, p. 208, 1902, p. 293; Champ., Ent. Mo. Mag., 1924, p. 239; Ann. Mag. Nat. Hist. (9), xv, 1925, p. 39, note. N.A.

var. *pulchellus* Blackb. *(Litochrus)*, 1895, p. 207, 1902, p. 293; Champ., Ent. Mo. Mag., 1924, p. 239. Q.

PARASEMUS Guilleb., Ann. Soc. Ent. Fr., 1894, p. 281, 300; Blackb., 1895, p. 210, table, p. 214, 1902, p. 295; Cat., p. 31.

ADUMBRATUS Blackb., 1902, p. 296. N.S.W.
ALPICOLA Blackb., 1891, p. 98. V.
COMES Blackb., 1895, p. 212. Q.
DISCOIDEUS Blackb., 1895, p. 211. Q.
DOCTUS Blackb., 1895, p. 212. N.S.W.
GROUVELLEI Guilleb., Ann. Soc. Ent. Fr., 1894, p. 300. Australia
INTERNATUS Blackb., 1895, p. 213. S.A.
LATERALIS Blackb., 1891, p. 97. S.A.
MITCHELLI Blackb., 1899, p. 24. Q.
MODESTUS Blackb., 1895, p. 212. Q.
OBSOLETUS Blackb., 1895, p. 213. Q.
PALLIDUS Blackb., 1902, p. 297. N.S.W.
SUTURELLUS Blackb., 1891, p. 96 *(Litochrus)*. W.A.
TORRIDUS Blackb., 1895, p. 211. Q.
UNIFORMIS Blackb., 1891, p. 98. S.A.
VICTORIENSIS Blackb., 1891, p. 101 *(Olibrus)*, 1895, p. 211. V.

Specimens of the family may commonly be taken in abundance by beating flowers and shrubs over an inverted umbrella. They may also be obtained from drying ferns, from moss, and occasionally by sieving fallen leaves; many specimens are also attracted to lights in the tropics.

The species of *Phalacrinus* may often be beaten into the umbrella in enormous numbers from drying branches of recently felled eucalyptus trees. Rust galls (*Uromycladium* spp.) often harbour large numbers of *Phalacrus fimetarius*. Being small, and seldom with distinctive markings, they are frequently passed over by collectors.

I examined all Blackburn's types, before sending them to the British

Museum, so was able to identify with certainty many of the species named by him; most of the species were also represented by cotypes and other authentic specimens in the South Australian Museum or in my own collection.

Blackburn did not use the tibiae in his generic table; had he done so he would no doubt have associated *Phalacrinus* with *Phalacrus*. The projection of the intercoxal process of the mesosternum varies according to the angles in which the coxae and femora are placed with it; on a specimen of *Litochrus longitarsis* the middle legs are level with the process, which scarcely projects beyond the coxae; on another specimen of the same species the legs are sloping at an angle of 45°, and the process appears to project considerably beyond them. I was unable to recognize with certainty *Merobrachys* and *Heterolitus*, which may be amongst the species referred by Blackburn and myself to *Litochrus*, but the other genera may be distinguished as follows:

a. Hind tibiae with apical fringe only.
  b. Scutellum much larger than in other genera .. PHALACRUS.
  bb. Scutellum of normal size .. .. PHALACRINUS.
aa. Hind tibae with apical fringe and two long unequal spurs.
  c. Basal joint of hind tarsi much longer than second .. LITOCHRUS.
  cc. Basal joint shorter than second .. .. .. PARASEMUS.

It is not always easy, however, to decide as to the relative proportions of the tarsal joints, even under a high power of the microscope.

The species are all small, and the generic characters are often difficult to see, examination under a compound power being always desirable and usually essential. The main features reside in the legs, especially in the hind tibiae and tarsi. With most species it is impossible to be sure of the genus, and even sometimes of the family, of specimens with legs and antennae concealed, the usual condition of specimens examined by myself before treatment; unless "set" when fresh, they are usually concealed under the body, so that in collections, specimens often placed with the family really belong to small Hydrophilidae (which differ in the antennae and palpi, and usually have more conspicuous punctures), Silphidae (*Anistoma* and similar genera), Nitidulidae (some of the smaller species with elytra completely covering the abdomen), Coccinellidae (small glabrous species), Chrysomelidae (minute species of *Paropsis*), and other families. Conversely specimens of the family may be placed with the other families named. Mr. F. E. Wilson has a large species of Corylophidae, which at first sight has a quite striking resemblance to members of the family, but has the head covered by the prothorax and the hind coxae widely separated.

All the species are polished, and many are brilliantly iridescent. The colour of the upper surface, apart from iridescence, is usually uniform, except that the

base of the prothorax, or at least its sides, is often paler than elsewhere; on many dark species the front of the head, the under surface, and legs are pale, and the antennae and palpi are usually entirely pale. Some species are conspicuously marked, but the markings are nearly always variable. All have the upper surface glabrous.

There are several species of the family that have the upper surface entirely pale, except that, in certain lights, the base of the prothorax, and elytra, and the suture of the latter appear very narrowly infuscated or black, forming a narrow T. At first glance, these species, except for size, are so close together that they might be considered as belonging to but one species, but some of them are sufficiently distinct. They are:

Litochrus koebelei Blackb.
L. noteroides Blackb.
L. tinctus Blackb.
Parasemus alpicola Blackb.
P. modestus Blackb.
P. pallidus Blackb.

Varieties of the following species are also almost entirely pale:

Litochrus alternans Blackb.
L. brunneus Er. (as identified by Blackburn).
L. laeticulus Blackb.
Parasemus suturellus Blackb.
P. torridus Blackb.

Of the new species *Litochrus intactus* and *Parasemus pallens* are also almost entirely pale.

Evidently *Merobrachys amabilis* Guilleb. is also an almost entirely pale species.

Several species of *Phalacrinus*, either typical or varietal, are also almost entirely pale, but their outlines are so different from the other pale species that they should not be confused with them.

Many of the pale specimens appear to have quite well-defined rows of punctures, as seen from directly above, but when viewed from oblique direction the apparent punctures disappear, being really due to "waterlogging." Blackburn made no mention of this in his descriptions, and in some cases appears to have been misled by it.

Many species vary considerably in size. The outlines are more or less oval or oblong oval, with the elytra sometimes obtusely pointed; in the Australian

species at least there is never any abrupt increase in the base of the elytra compared with the base of the prothorax. The narrower species are generally more convex than the wider ones. On many species, viewed from the sides, the greatest height is shortly behind the scutellum, where it might be almost gibbous.

There is nearly always a distinct, but not complete, stria on each side of the suture; others, if present, are usually faint; or there may be rows of small punctures not set in striae. The interstices are often impunctate, and even when punctures are present they are mostly visible with difficulty. On several species minute oblique scratches may be seen in certain lights on the sides of the elytra. A slight amount of grease or dust usually obscures the sculpture, so I usually brushed the specimen with chloroform.

Champion wrote that the sexes are not usually distinct, but that "The males can generally be recognized by their stouter anterior tarsi or broader head, and in two species at least . . . by the elongated antennae"; also that the male sometimes has longer jaws, and in *Phal. maximus* a "densely punctured, transverse, pubescent pad along the centre of the apical margin of the second and third ventral segments." The sexes of the types, however, have seldom been noted; and as the jaws are usually clenched it is difficult to force them apart without damaging the head; the antennae also vary considerably in appearance according to how they are mounted on microscope slides, or examined dry, and the abdomens of specimens mounted in the ordinary way are usually so clogged with gum that it is difficult to clean them for examination.

It was not considered desirable to describe the relative lengths of joints of the antennae, as these vary to a certain extent sexually, and if examined dry they differ in appearance from various points of view; even when mounted in Canada balsam they vary in appearance.

At least one hind leg of each of the new species was mounted in Canada balsam and carefully examined under the microscope before the species was referred to its genus. In every instance, when referred to *Litochrus*, the first joint of the tarsis was longer, and usually much longer than the second; in every instance, when referred to *Parasemus*, the second joint was longer than the first. Each has an apical fringe of setae to the hind tibiae and (except in *Phalacrus* and *Phalacrinus*) two unequal spines.

If the hind tarsi are so mounted that the joints can be seen from the side the suture between the two basal joints, in *Parasemus* at least, is more distinct than if mounted so as to be seen directly from above or below. Usually two hind legs and two antennae of one specimen were mounted on a slide. With the highest power used it was not always easy to see the sutures between the joints, owing

to the density of the setae more or less obscuring them. Blackburn apparently examined detached parts loose, afterwards gumming them on cards with the specimens from which they were removed.

The sketches of the elytra are drawn from one side, so that the suture, instead of appearing as a straight line, appears as a curved one, thus allowing the full extent of the markings to be shown.

Owing to their polished surface, water gums will seldom hold specimens set on their backs, so it is desirable to use Canada balsam for them; even this is not always effective.

PHALACRUS INSIGNIS sp. nov.

Fig. 1-3.

Black, with a slight bluish gloss, median joints of antennae and tarsi obscurely diluted with red.

Head with minute punctures, becoming scarcely visible on prothorax. Each elytron with sutural stria distinct from apex to about basal third, and faintly traceable almost to base; with rows of small but fairly distinct punctures, alternated with less distinct ones, and becoming irregular on sides, where they are mixed with minute scratches; space about scutellum impunctate. Length, 3·5–4·2 mm.

Queensland: Cairns (E. Allen), Cornwallis Island (C. T. McNamara); North Australia: Bathurst and Melville Islands (G. F. Hill), Connexion Island and Groote Eylandt (N. B. Tindale).

Much larger than any species of the family previously recorded from Australia. The rows of punctures on the elytra are fairly distinct, but to see the lateral scratches a good light is necessary. The jaws of the male are long and, when not clenched, very prominent.

PHALACRUS FIMETARIUS F.

P. CORRUSCUS Panz.

In comparing the elytral puncturation of *P. corruscus* with that of *P. burrundiensis*, Blackburn wrote: "In *corruscus* it is fine, close, and even, there being no striae (except the sutural one), and scarcely a trace of longitudinal arrangement in any part of the puncturation." This agrees well with some English specimens that were in his collection, and others from South Australia and Victoria, but on many others from his collection a faint linear arrangement of punctures may be traced in certain lights, and these gradually increase in strength, until it is difficult to tell where *corruscus* ends and *burrundiensis* begins.

Some large specimens, from Tasmania, bear quite regular rows of, for the family, fairly strong punctures, and were labelled by Blackburn as *corruscus;* other specimens from New South Wales and South Australia agree closely with them.

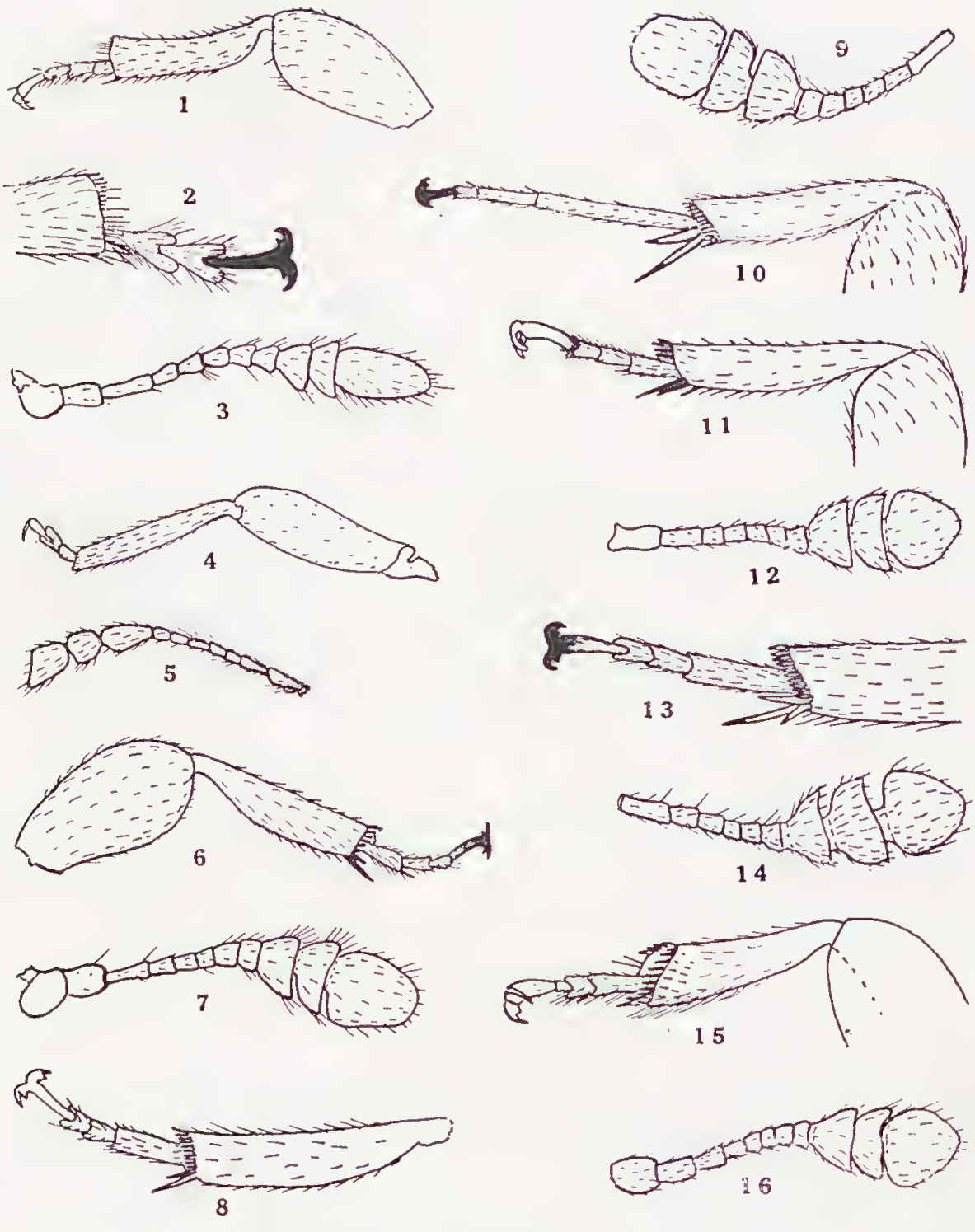

Fig. 1–16. 1, *Phalacrus insignis* Lea, middle leg. 2, *ditto*, hind leg. 3, *ditto*, antenna. 4, *Phalacrinus nigriclavus* Lea, hind leg. 5, *ditto*, antenna. 6, *Litochrus caerulcotinctus* Lea, hind leg. 7, *ditto*, antenna. 8, *L. pallidipes* Lea, hind leg. 9, *ditto*, antenna. 10, *L. longitarsis* Lea, hind leg. 11, *L. obscuripes* Lea, hind leg. 12, *ditto*, antenna. 13, *L. pallidicollis* Lea, hind leg. 14, *ditto*, antenna. 15, *L. parvoniger* Lea, hind leg. 16, *ditto*, antenna.

A specimen from Lucindale and two from Ulverstone have the legs, antennae, and upper lip reddish, but are probably immature. The species may commonly be taken in rust galls *(Uromycladium Tepperianum)*, on wattle trees, as well as in general collecting; Mr. R. Veitch also sent specimens that were seen eating smut on prairie grass in Queensland.

Queensland: Brisbane, Cairns, Endeavour River, Ingham, Mabuiag Island, Magnetic Island, Peel Island, Rockhampton, Stradbroke Island; New South Wales: Armidale, Bindogundra, Blue Mountains, Cootamundra, Forest Reefs, Galston, Lawson, Mittagong, Sydney, Upper Williams River; Victoria: Alps, Bacchus Marsh, Dividing Range, Ringwood; Tasmania: Devonport, Hobart, Huon River, Jordan River, Launceston, Ulverstone, West Tamar, Zeehan; South Australia: Adelaide, Barton, Carribie, Cook Plains, Henley, Hughes, Kangaroo Island, Kingoonya, Largs, Lucindale, Melrose, Minnie Downs, Mount Lofty, Oodnadatta, Port Lincoln, Port Noarlunga, Quorn, Tarcoola; West Australia: Cue, Mount Barker, Pinjarrah; North Australia: Darwin, Connexion Island.

PHALACRUS BURRUNDIENSIS Blackb.

This species was described from a single specimen from North Australia, but in the Blackburn collection a specimen from Quorn was labelled as *burrundiensis*, and bears his number 3625 (the same number as the type). Of three specimens from Darwin, mounted on the same card, two have, for the genus, quite strong elytral striae, on the other they are rather feeble. Other specimens that are certainly *burrundiensis* have been taken in company with some which are certainly *fimetarius*, and it is doubtful if the former should be regarded as more than a variety of the latter.

Queensland: Cairns, Moa Island, Rockhampton; New South Wales: Cootamundra; Tasmania: Launceston; South Australia: Ooldea, Port Lincoln, Port Noarlunga; North-West Australia: Fortescue River; North Australia: Darwin, Roper River.

PHALACRINUS.

Blackburn described the clypeus of species of this genus as being produced in front and concealing the labrum, but the clypeus itself is extremely short, and although the labrum is invisible from above, this is not due to the production of the clypeus. The species of the genus can be distinguished at a glance, from those of all other genera, occurring in Australia, by the elytra. On all others they have an even curvature throughout, except that the sides are very narrowly margined, but on *Phalacrinus*, towards the sides, the surface is slightly flattened out, with the extreme sides narrowly margined. As a result the elytra are dis-

tinctly wider in proportion. On putting the insects on their backs, it may also be seen that the sides of the prothorax and elytra are more produced than on other genera, so that the body parts appear to be in a deep cavity. Blackburn nowhere even mentioned the tibiae; under a high power these are seen to be fringed, but without longer apical spines; the genus is therefore near *Phalacrus*.

Mr. C. T. McNamara and I took a species of the genus in abundance from drying foliage at Singapore; it is about the size of Tasmanian examples of *P. comis*, and very much the colour, but as it may have been named under another genus, it seems desirable to record it here by the genus only.

PHALACRINUS NIGRICLAVUS sp. nov.

Fig. 4-5.

Bright castaneous, abdomen, palpi, and legs slightly paler; antennae, except basal third, deeply infuscated or black.

Head and prothorax with extremely minute punctures. Each elytron with sutural stria distinct to about basal fourth; with series of minute punctures, becoming stronger on sides. Length, 2·8–3·0 mm.

New South Wales: Upper Williams River (F. E. Wilson and A. M. Lea); Queensland: Mount Tambourine (Lea).

With the general outlines of most species of the genus, but with fewer striae on the elytra, and the series of punctures decidedly smaller than on all of them. The abdomen has a series of small shallow foveae, at the base of the second, third, and fourth segments; such foveae may be seen on other species of the genus, although not commented upon by Blackburn. The colour of the thirteen specimens examined is uniform, except that on two of them the elytra appear to be faintly bifuscate posteriorly, this being due to the dark wings showing through them. On several specimens, owing to "waterlogging," the sutural stria on each elytron appears traceable as a series of punctures to the base itself, but from oblique directions the stria is seen to terminate some distance from it. The two outer rows of punctures on each elytron, although minute, are distinctly stronger than the other rows, and about the shoulder curve inwards, and rather abruptly terminate; there are very fine punctures on the marginal interstice and apical half of the second one. The hind tarsi are rather short, the first joint is distinctly longer than the second, and, owing to the prolongation of its lateral lobes, its sides appear twice as long as its base.

Two specimens from the Blackburn collection, from North Queensland, may belong to the species; they are smaller, 2·3 mm., and more convex, but have similar elytral striae and punctures.

PHALACRINUS AUSTRALIS Blackb.

The extent of infuscation of the elytra of this species varies considerably, although the outlines of the infuscation are seldom sharply defined. Several specimens have finely infuscated lines on the inner parts of the elytra. The length ranges 2·0–2·5 mm. Specimens may be beaten from the drying leaves of recently felled eucalypti in large numbers.

New South Wales: Dalmorton, Forest Reefs, Millthorpe, Sydney; Victoria: Eltham; South Australia: Kangaroo Island, Lucindale, Melrose, Morgan, Mount Lofty, Murray River, Ooldea.

PHALACRINUS ROTUNDUS Blackb.

As commented upon by Blackburn, this species is distinctly wider in proportion (more circular in outline) than *P. australis* and other species of the genus. The general colour is rather dingy flavous or testaceous, the elytra conspicuously infuscated towards the sides, but not at the extreme margins. The size ranges 2–3 mm.

Victoria: Sea Lake; South Australia: Mount Lofty, Port Lincoln; West Australia: Geraldton, Mount Barker, Swan River.

PHALACRINUS UMBRATUS Blackb.

Unsatisfactorily close to *P. australis* and *obtusus*, if these are really distinct. Specimens from Dalmorton, the type locality, and Tamworth appear to agree with the common species in West Australia, many of which have a narrowly lined appearance, owing to the slight infuscation of the striae; on such specimens the lateral infuscation is more defined than usual.

New South Wales: Dalmorton, Tamworth; West Australia: Beverley, Geraldton, Karridale, Mount Barker, Mullewa, Swan River.

PHALACRINUS NAVICULARIS Blackb.

The type of this species was unique and from Victoria, but three specimens from New South Wales were standing in the Blackburn collection under the name, and appeared to agree with the type; these specimens, and some others from New South Wales, have a more or less angular (usually triangular) pale spot behind the scutellum (by a slip Blackburn wrote behind the suture). On four of them the disc of the prothorax is infuscated, on three others it is uniformly pale. In his table of the genus Blackburn placed the species with those having "Elytra without any distinctly punctulate striae." The specimens from some directions appear to have no punctures in the striae, but from others fairly distinct ones may be seen, as on others of the genus.

New South Wales: Armidale, Glen Innes, Hastings River; Victoria: Dividing Range.

PHALACRINUS COMIS Blackb.

A large species, the average size being about equal to that of *P. notabilis*, from pale specimens of which it may be distinguished by the finer punctures of the elytral striae, especially on the sides.

New South Wales: Barrington Tops; Victoria: Dividing Range; Tasmania: Beaconsfield, Hobart, Huon River, Karoola, Launceston, Mount Wellington, Turner's Marsh, Tyenna.

LITOCHRUS CAERULEOTINCTUS sp. nov.

Fig. 6-7.

Black, elytra with a bright bluish iridescence.

Head with very minute punctures, becoming larger but still very minute on prothorax. Each elytron with sutural stria distinct to basal fourth and traceable almost to base; with rows of minute punctures, mostly vanishing about base, the interstices with very minute punctures, larger on sides than towards suture. Length, 2·0–2·8 mm.

New Guinea: Finsch Haven (Rev. L. Wagner); Papua: Mount Lamington (C. T. McNamara).

In general appearance much like *Parasemus fulgidus*, but with the tarsi of *Litochrus*. Ten specimens have the prothorax highly polished but not iridescent; of these eight have the elytral iridescence bluish, on the ninth it is more purplish; the tenth, and largest, specimen has the elytra more brilliantly iridescent, and its pronotum has a distinct greenish gloss. The second and several of the following joints of the antennae are not quite as black as the club. The clothing of the hind tarsi obscures their outlines, but under a high power the first joint is seen to be about twice as long as the second.

A specimen from Queensland (Dunk Island, C. L. Barrett) in Mr. F. E. Wilson's collection, appears to belong to this species, but is badly damaged.

LITOCHRUS PALLIDIPES sp. nov.

Fig. 8-9.

Black, elytra with a bright bluish iridescence; antennae, palpi and legs flavotestaceous.

Head and prothorax with very minute punctures. Each elytron with sutural stria distinct on apical half, and faintly traceable to near base; with rows of minute punctures, becoming larger but still minute towards apex and sides, and

disappearing near base, the interstices with very minute punctures. Length, 2·4–2·6 mm.

New Guinea: Bisiatabu (Rev. W. N. Lock), Finsch Haven (Rev. L. Wagner); Papua: Mount Lamington (C. T. McNamara).

A brightly iridescent species, structurally close to the preceding, but slightly narrower, and with pale antennae, palpi, and legs. The punctures on the elytral interstices are very minute, towards the sides, in certain lights, they appear to be seriate in arrangement, although smaller than the regular rows. The basal joint of the hind tarsi is twice as long as the second.

LITOCHRUS LONGITARSIS sp. nov.

Fig. 10.

Black, elytra with a bluish iridescence; front of head, sides of prothorax and margins of elytra narrowly brown, under surface castaneous-brown, antennae, palpi, and legs somewhat paler.

Head and prothorax with scarcely visible punctures. Each elytron with sutural stria distinct to basal third and traceable for a short distance towards the base; with rows of minute punctures, disappearing towards base, but fairly sharply defined posteriorly, where also the interstices have very minute punctures. Length, 2 mm.

Papua: Mount Lamington (C. T. McNamara).

Structurally close to the preceding species, but margins and under surface pale, as well as the appendages; the basal joint of the hind tarsi is also longer, being thrice as long as the second. The pale margins of the elytra are sufficiently distinct on the apical half, but are extremely narrow on the basal half. On two of the specimens the prothorax is less dark than the elytra, and its base, as well as its sides, are somewhat brownish.

LITOCHRUS OBSCURIPES sp. nov.

Fig. 11-12.

Black, elytra usually with a slight bluish iridescence, antennae, palpi, tibiae, and tarsi of a rather dingy brown.

Head and prothorax with extremely minute punctures. Each elytron with sutural striae distinct to basal third, and traceable for a short distance towards the base; with series of minute punctures, fairly distinct posteriorly, but disappearing before base; interstices scarcely visibly punctate posteriorly and not at all elsewhere. Length, 1·5–1·9 mm.

New Guinea (P. Hossfeld); Papua: Mount Lamington, abundant (C. T. McNamara).

In general appearance like *L. caeruleotinctus* on a small scale, but less iridescent, and club of antennae not black, although infuscated. In general appearance also it is fairly close to the Australian *L. maritimus*. The femora are usually as dark as the under surface, but occasionally are no darker than the tibiae, the elytra are usually obscurely diluted with brown posteriorly, their punctures are fairly distinct in certain lights, but from most directions are invisible. The basal joint of the hind tarsi is much longer than the second.

LITOCHRUS PALLIDICOLLIS sp. nov.

Fig. 13-14.

Flavo-testaceous, antennae, palpi, and legs paler, elytra piceous-brown and brightly iridescent.

Head and prothorax with extremely fine punctures. Each elytron with sutural stria distinct to basal third and traceable for a short distance nearer the base; with series of minute punctures, fairly distinct posteriorly, but not traceable to base, the interstices with very minute punctures posteriorly. Length, 2·2–2·5 mm.

New Guinea: Finsch Haven, to light (Rev. L. Wagner); Papua: Mount Lamington (C. T. McNamara).

To a certain extent resembling some specimens of *L. alternans*, but the prothorax distinctly paler than the elytra, and not paler at base. The abdomen is sometimes no darker than the legs, but sometimes is as dark as the metasternum, which is usually the darkest part of the under surface. The basal joint of the hind tarsi is much longer than the second.

LITOCHRUS PARVONIGER sp. nov.

Fig. 15-16.

Blackish, antennae, palpi, tibiae, and tarsi flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria fairly distinct to about basal fourth; series of punctures scarcely traceable. Length, 1·4–1·6 mm.

New Guinea: Bisiatabu (Rev. W. N. Lock); Papua: Mount Lamington (C. T. McNamara).

A minute dark species, the club of the antennae not at all infuscated distinguishes from *L. obscuripes;* the femora are almost as dark as the under surface, which is not quite as dark as the upper surface. The basal joint of the hind tarsi is about twice the length of the second.

LITOCHRUS FUMATUS sp. nov.

Fig. 17.

Piceous-brown, antennae, palpi, and legs flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria fairly distinct to basal third, and traceable for a short distance towards the base, series of punctures scarcely traceable even on apical half. Length, 1·4 mm.

New South Wales: Sydney (A. M. Lea).

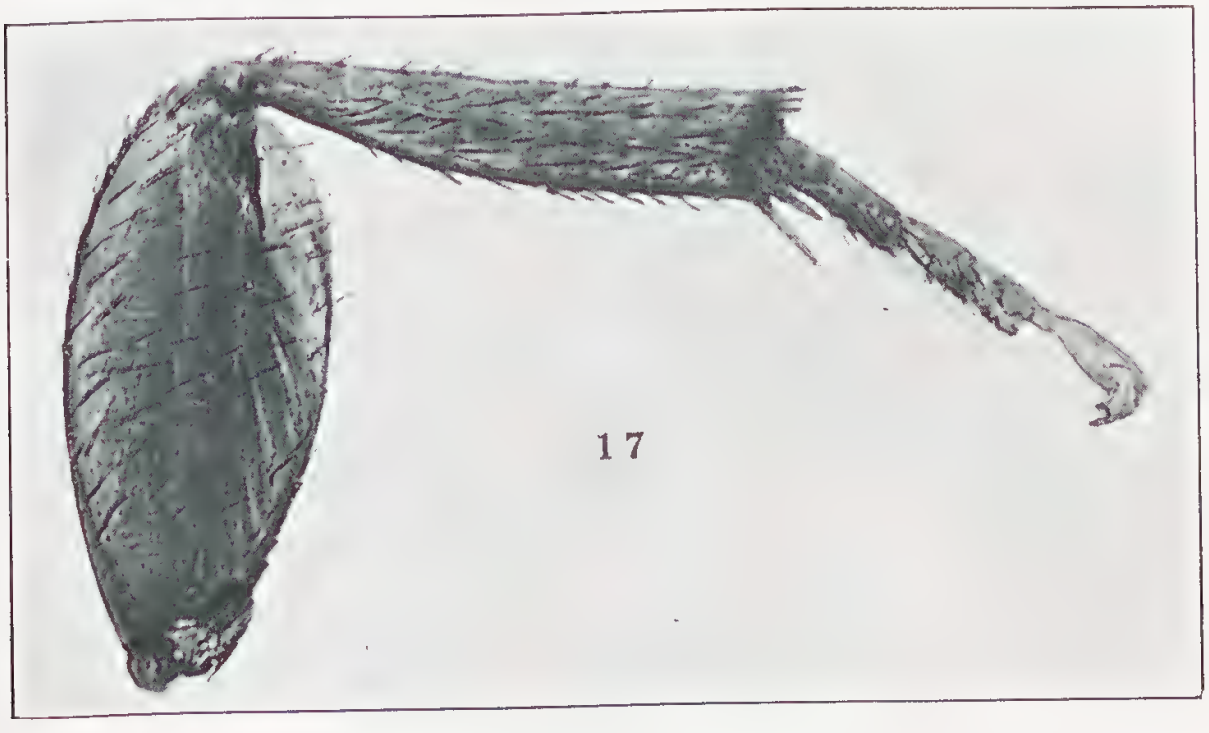

Fig. 17. *Litochrus fumatus* Lea, hind leg.

The size of *L. baccaeformis*, but slightly narrower and darker; also much like *Parasemus mitchelli* and *parvopallidus*, but with the hind tarsi of *Litochrus*, the basal joint being about twice the length of the second.

LITOCHRUS INTACTUS sp. nov.

Fig. 18-19.

Castaneo-flavous, antennae, palpi, and legs slightly paler.

Head and prothorax with scarcely visible punctures. Each elytron with sutural stria distinct to basal fourth, and traceable to base; with series of minute punctures, becoming fairly distinct posteriorly, the interstices with rather dense and still more distinct punctures, scarcely visible in scutellar region. Length, 2·0–2·2 mm.

Papua: Mount Lamington (C. T. McNamara).

In general appearance like pale enlarged *Parasemus pallens*, but with the hind tarsi of *Litochrus*, these being long and thin, with the first joint more than twice the length of the second. The general colour is much as that of *L. note-*

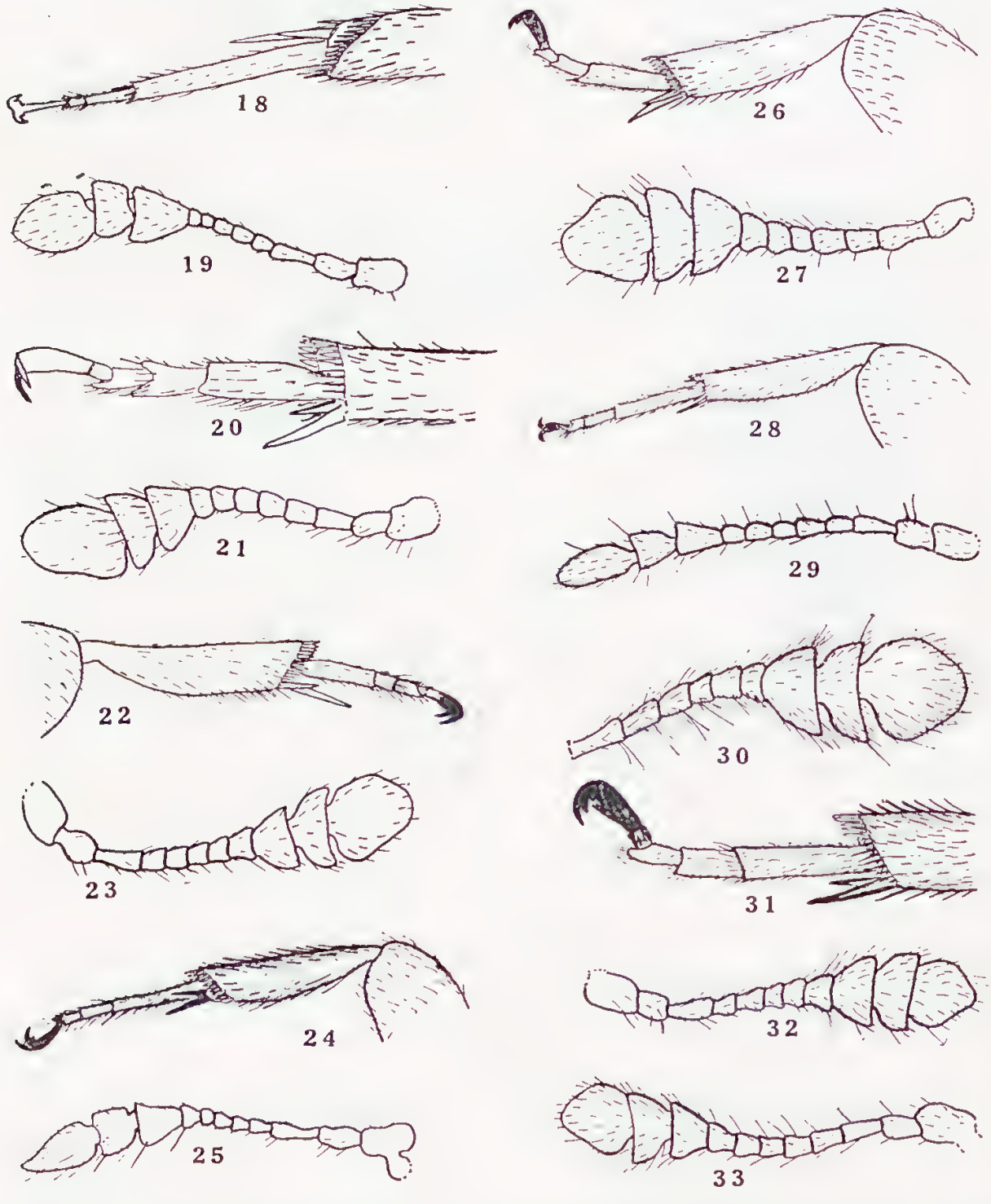

Fig. 18–33. 18, *Litochrus intactus* Lea, hind leg. 19, *ditto*, antenna. 20, *L. ruficollis* Lea, hind leg. 21, *L. blackburni* Lea, antenna. 22, *L. flavonotatus* Lea, hind leg. 23, *ditto*, antenna. 24, *L. v-niger* Lea, hind leg. 25, *ditto*, antenna. 26, *L. majorinus* Lea, hind leg. 27, *ditto*, antenna. 28, *L. divergens* Lea, hind leg. 29, *ditto*, antenna. 30, *L. basipennis* Lea, antenna. 31, *ditto*, hind leg. 32, *L. apiciflavus* Lea, antenna. 33, *Parasemus fulgidus* Lea, antenna.

roides, but the elytra are distinctly less narrowed posteriorly. The elytra are very slightly paler than the prothorax, and on one specimen there are four faintly waterlogged lines on the left elytron and three on the right. In certain lights the elytral interstices are seen to be closely covered with very minute punctures, somewhat obscuring the regular series.

LITOCHRUS RUFICOLLIS sp. nov.

Fig. 20.

Head, prothorax, and scutellum bright red, under surface, antennae, palpi, and tarsi reddish-castaneous; elytra black with a slight bluish iridescence.

Head and prothorax with very minute but fairly sharp punctures. Each elytron with sutural stria distinct to basal fourth, and traceable to near base; with regular rows of small but distinct punctures, almost vanishing near base, the interstices with numerous very minute punctures. Length, 3 mm.

South Australia: Melrose (A. M. Lea). Unique.

A large, beautiful species, with well-defined rows of punctures on the elytra; the sutural stria from most directions appears to be a stria only, but in certain lights the part nearest the base is seen to be composed of narrow punctures; the adjacent row of punctures and parts of the others also appear to be striated, but in a good light, and from oblique directions are seen to be seriate punctures only. The basal joint of the hind tarsi is about twice the length of the second.

LITOCHRUS BLACKBURNI sp. nov.

Fig. 21, 66.

More or less bright castaneo-flavous, head black, the muzzle obscurely reddish, elytra black, with a brilliant bluish iridescence, and with two large, round, pale spots.

Head and prothorax with very minute punctures. Each elytron with sutural stria distinct on apical half only, but traceable almost to base; with rows of minute punctures, distinct only on apical half, the interstices with minute punctures. Length, 3·0–3·5 mm.

New Guinea (P. Hossfeld): Papua: Mount Lamington (C. T. McNamara).

The most beautiful species of the family that I have seen from any part of the world, and named with pleasure after the late Rev. T. Blackburn. The large spot on each elytron is situated at about the apical third, and is slightly nearer the suture than the side. The first joint of the hind tarsi is more than twice the length of the second.

LITOCHRUS FLAVONOTATUS sp. nov.

Fig. 22-23, 67-68.

Deep shining black, elytra with a bluish iridescence and with two flavous spots near apex, muzzle, hind angles of prothorax, and tip of abdomen obscurely brown, antennae, palpi, and legs flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria fairly distinct to basal third, and traceable for a short distance towards the base, with a shorter and less distinct stria near the first; with rows of minute punctures, but not to base, the interstices with very minute punctures. Length, 2 mm.

New Guinea (P. Hossfeld); Papua: Mount Lamington (C. T. McNamara).

The spot on each elytron is very conspicuous and variable in size, but its margins are not very sharply defined, and are iridescent as well as the rest of the elytra. The spots are nearer the apex than on *Parasemus bimaculiflavus*. The elytral punctures are very minute, but in certain lights the rows are fairly distinct on the apical half. The basal joint of the hind tarsi is more than twice as long as the second.

LITOCHRUS V-NIGER sp. nov.

Fig. 24-25, 69.

Bright castaneo-flavous, abdomen, antennae, palpi, and legs slightly paler, elytra with a large black V, not quite touching shoulders, or suture at apical third.

Head and prothorax with scarcely visible punctures. Each elytron with sutural stria distinct to about basal fourth; with rows of minute punctures. Length, 2 mm.

Papua: Mount Lamington (C. T. McNamara).

Very distinct by the black V. The series of punctures on the elytra are fairly distinct on the apical half, but not traceable to the base, the interstices in some lights are seen to have minute punctures, which may also appear to be somewhat seriate in arrangement, but they are visible with difficulty. The hind tarsi are long and thin, the first joint more than twice as long as the second.

LITOCHRUS MAJORINUS sp. nov.

Fig. 26-27, 70-71.

Dark piceous-brown with a bluish iridescence, a large part of elytra, under-surface, antennae, palpi, and legs flavo-castaneous.

Head and prothorax with minute but fairly sharp punctures. Each elytron

with sutural stria distinct to basal fourth and faintly traceable to near base, with rows of close-set punctures, fairly distinct on apical half, but almost vanishing towards base, the interstices with very minute punctures. Length, 3·0–3·2 mm.

Queensland: Dunk Island, in August (H. Hacker). Cairns district (F. P. Dodd).

A large species, with much of the elytra pale; the pale portion does not begin abruptly and cut square across, as on *L. lautus*, and the whole insect is longer, narrower, and more convex. On *L. plagiatus* the marking is not continued to the base or apex. The pale portion of the elytra commences at the scutellum, obliquely dilates to the basal fourth, is then narrowed to the apical fourth, and is then abruptly dilated to the sides; the base of the prothorax is narrowly pale. There is only one true stria on each elytron, but the punctures in the series are so close together that in certain lights they appear to form striae. The basal joint of the hind tarsi is more than twice as long as the second.

LITOCHRUS DIVERGENS sp. nov.

Fig. 28-29, 72.

Blackish, a somewhat pear-shaped mark on elytra, under surface (metasternum darker than abdomen), antennae, palpi, and legs flavo-castaneous.

Head and prothorax scarcely visibly punctate. Each elytron with two striae near suture, and with faint rows of minute punctures, the interstices scarcely visibly punctate. Length, 2·8 mm.

Queensland: Cairns (E. Allen), Brisbane (A. M. Lea).

Readily distinguished from the other fairly large species with suture partly pale, by the two striae on each elytron; the first of these is very close to the suture, and in certain lights traceable to the base, the second commences with the first at the apex, and evenly diverges from it till at the basal fifth, where it practically terminates; it is about four times as distant from the first as the first is from the suture; it is supplied with minute punctures, although these are invisible from most directions. The mark on the elytra commences rather narrowly on the base, and dilates to its widest at the apical third, soon after which it terminates; the muzzle and the sides of the prothorax and of the elytra are narrowly paler than the adjacent parts. The basal joint of the hind tarsi is more than twice as long as the second.

LITOCHRUS BASIPENNIS sp. nov.

Fig. 30-31, 73-76.

Head, prothorax, scutellum, and a narrow part of base of elytra suddenly dilated on shoulders, black or blackish; rest of elytra, part of antennae, palpi,

and legs flavous; under surface blackish-brown, abdomen usually somewhat paler than metasternum.

Head and prothorax with very minute punctures. Each elytron with sutural stria distinct to about basal fourth, and traceable almost to base; with rows of minute punctures, fairly distinct on apical half, the interstices with scarcely visible punctures. Length, 2·5–2·8 mm.

New South Wales: Dorrigo (W. Heron), Comboyne (W. H. Muldoon), Upper Williams River, in October (F. E. Wilson and A. M. Lea); Queensland: Buderim Mountain, in December (C. J. Wild, in Queensland Museum), Cairns district (Lea).

Five of the specimens have very distinctive elytral markings, on two others they appear to denote an approach to some forms of *L. laeticulus*. The black or blackish part of the elytra, on each of five specimens, occupies about one-fifth of the base, half-way to each side it is dilated at a right angle, and then cut off till near the side, along which (but not on the extreme margin, which is narrowly pale) it is narrowly continued for a short distance; on two other specimens the black portion of the base is subtriangularly continued for a short distance along the suture, and on one of them the shoulder marking is faintly connected with the suture beyond the middle. The muzzle and sides of the prothorax are obscurely pale. The elytra are faintly iridescent. On several specimens, from directly above, the elytra appear to have quite distinct rows of punctures, and a second stria on each, but this is due to "waterlogging"; from oblique directions the rows of punctures are seen to be very minute, and the apparent second stria resolves itself into a close-set row of minute punctures. The basal joint of the hind tarsi is more than twice as long as the second.

Two specimens, that may represent a variety of this species, have the dark parts of the upper surface of a rather dark brown, with the muzzle and sides of prothorax more widely pale, and the dark parts of the elytra consisting of a patch on each shoulder (ill-defined posteriorly) very narrowly connected across the base. The under surface is entirely pale.

LITOCHRUS BINOTATUS sp. nov.

Fig. 77-78.

Blackish-brown, two spots on elytra, antennae (part of club infuscated), under surface, palpi, and legs flavo-castaneous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria distinct to basal fourth, and traceable for a short distance towards base;

with rows of minute punctures, fairly distinct on apical half, the interstices with very minute punctures. Length, 1·8–2·0 mm.

Queensland: Hamilton, in January (C. J. Wild), Mount Tambourine, in January (A. M. Lea); New South Wales: Armidale (Lea).

The elytra are slightly iridescent; the spot on each is somewhat round, and, although distinct, its outer parts are not sharply defined; on the type it is at the basal third and isolated, on another specimen it is vaguely connected with the base, and on a third almost connected with it. To a certain extent the markings approach those of some forms of *L. laeticulus,* but it is shorter than that species, and more convex. In some lights the minute punctures, on parts of the elytral interstices, appear to be almost as seriate in arrangement as those in the regular series. The first joint of the hind tarsi is much longer than the second.

LITOCHRUS APICIFLAVUS sp. nov.

Fig. 32, 79-81.

Black, elytra slightly iridescent, their apex, the antennae, palpi, and legs flavous; under surface dark brown, the abdomen usually paler.

Head and prothorax with very minute punctures. Each elytron with sutural stria fairly distinct to about the basal third; with rows of minute punctures, fairly distinct on apical half, and not traceable to base; the interstices with very minute punctures. Length, 1·9–2·1 mm.

North Australia: Roper River and Groote Eylandt (N. B. Tindale), Melville Island (W. D. Dodd), Darwin (G. F. Hill); North Queensland (Blackburn's collection), Port Douglas (C. J. Wild), Cairns (F. P. Dodd), Endeavour River (C. French, sen.), Stradbroke Island (J. H. Boreham and H. J. Carter), Bribie Island (H. Hacker and A. M. Lea), Brisbane (T. McGregor); New South Wales: Tweed River (Lea).

The pale tips of the elytra usually appear as two conjointed spots, which are sometimes almost white and usually sharply limited, but on two out of three specimens from the Tweed River they are more obscure. On many of the specimens each elytron is obscurely diluted with red at the basal third, but on only one is there a fairly distinct spot there (fig. 81). On two specimens the upper surface is of a rather dark brown only, probably from immaturity, with the apical markings less sharply defined. The muzzle is usually obscurely paler than the base of the head, the abdomen is sometimes scarcely darker than the legs. In some lights there appears to be a shorter second stria, and even a third one on each elytron, but this appearance is really due to close-set punctures, as may be seen from oblique directions. The first joint of the hind tarsi is twice as long as the second. The type is from Groote Eylandt.

LITOCHRUS BRUNNEUS Er.

Fig. 82-84.

In the original description of this species the colour was noted as "brunneus," and again "supra dilute brunneus . . . infra cum antennis pedibusque testaceus," and the length as $1\frac{1}{4}$ (German) lines about 3 mm.).

In dealing with the family in 1891, the species was evidently unknown to Blackburn; in 1895 he commented on "an example from Tasmania which I have no doubt is *Litochrus brunneus* Er.", and included it in a table; in 1902 he compared *L. perparvus* with "the Tasmanian *Litochrus* that I believe to be *brunneus* Er.", and again included it in a table.

The species he presumed to be *brunneus* was represented in his collection by several specimens bearing his name labels, and is a very common one in Tasmania. It may be obtained in general collecting, but also from ferns and mosses; on some ferns growing on a tree fern *(Dicksonia antarctica)* at Mount Wellington, on one occasion, I saw thousands of specimens. It differs, however, from the description in being consistently smaller (1·8–2·8 mm., the average being 2·2 mm.); the base and suture of the elytra are narrowly black, and there is a conspicuous infuscation (sometimes almost black) extending from each shoulder to the middle, or even sometimes to the apex, but it is sometimes very short; the base of the head is usually also infuscated. Three specimens from Tasmania have the upper surface entirely pale, flavous-brown, or flavous, and there are similar specimens from Sydney and Dorrigo before me; one Sydney specimen has a minute dark spot on each shoulder.

New South Wales: Dorrigo, Mittagong, Mount Kosciusko, Sydney; Victoria: Warburton; Tasmania: Beaconsfield, Bruni Island, Cradle Mountains, Georgetown, Hobart, Huon River, Karoola, Kelso, Launceston, Mount Wellington (including the summit), St. Marys, Waratah, Wilmot.

LITOCHRUS ALTERNANS Blackb.

Queensland: Cairns, Goodna; New South Wales: Blue Mountains, Forest Reefs, Galston, Mittagong, Mount Victoria, Sydney, Wentworth Falls; Victoria: Alps, Bogong Plains (5,000-6000 feet), Healesville; Tasmania: Beaconsfield, Denison Gorge, Frankford, Hobart, Huon River, Karoola, Kelso, Launceston, Marrawah, Mount Wellington, Ulverstone; South Australia: Kangaroo Island, Lucindale, Mount Lofty, Minnipa.

The punctures on the prothorax of this species are all minute and visible with difficulty, although in the original description it is stated that it had "a few scattered punctures evidently much larger"; the elytra were also stated to have

"a conspicuous row of considerably larger and widely scattered punctures." The colour was noted as "supra lividus, hic illii infuscatus, coeruleo irideseens, antennis palpis, pedibus et corpore subtus testaceis."

It was named originally from the alpine district of Victoria, and there was a long series of specimens (including cotypes) standing under the name in the Blackburn collection from Victoria and Tasmania, but it occurs also in other parts of Australia. Whilst not mentioned in the original description, the base and sides of the prothorax are narrowly paler than the disc, although sometimes the difference in shade is but slight.

The size varies from 2·5 to 3·3 mm., the average being about 3·0 mm.

All the specimens have a bright (although hardly brilliant) bluish iridescence.

Of a pair taken *in cop.* on Mount Wellington, one specimen is almost black, with the paler base and sides of the prothorax very narrow; the other specimen is a bright castaneous, with the disc not at all infuscated. A smaller pair from Hobart, also taken *in cop.*, are almost uniformly moderately brown on the upper surface, with the paler base and sides of the prothorax fairly distinct.

Some of the smaller and paler forms, both from the mainland and Tasmania, are very close in appearance to *brunneus* (as identified by Blackburn, but differ in being distinctly iridescent and by having no dark vitta from each shoulder.

I think it is possible that it is the real *brunneus* of Erichson.

One bright castaneous specimen from Mount Wellington has the pronotum lightly infuscated in the middle and each elytron with a large postmedian infuscation, but in addition each elytron has six infuscated lines interrupted at the basal fourth, having a "waterlogged" appearance, as on many specimens of *Cordus hospes*. The lines are probably post-mortem.

The striations and punctures on the elytra are more distinct on some specimens than on others, which, nevertheless, are identical in colour.

LITOCHRUS TINCTUS Blackb.

I cannot see the slightest structural difference between some cotypes and many other specimens of this species and specimens identified by Blackburn as *brunneus*. In his table Blackburn separates them by the rows of punctures on the alternate interstices of the elytra, but the punctures (X on the apical slope of the elytra) are distinct only in the rows. There are minute punctures elsewhere on the elytra, but (at least from the base to slightly beyond the middle) they are quite as variable on Tasmanian specimens (with the infuscated markings of typical *brunneus*) as on the entirely pallid Queensland and Northern

Australian forms of *tinctus*, and they are never sharply defined, although more distinct in some lights than in others.

On several specimens (owing to "waterlogging") there appear to be fairly strong rows of punctures or short infuscated lines on the elytra, as noted on other species of the genus, but viewing these from the sides, the apparent punctures disappear, although not the infuscations.

In the original description the elytra were noted as having "basis versus indeterminate lineis macularibus fuscis notatis," and several of the cotypes are so marked, but the markings are due to "waterlogging," and are mostly post-mortem. They agree absolutely in structure with other specimens from Cairns in which the elytra are entirely without markings or have only slight humeral ones. Blackburn (1) appeared to think the markings and larger size distinguished the species from *Micromerus amabilis* Guillebeau, but many specimens before me are much smaller (down to 1·5 mm. smaller than the cotypes), and I think it probable that it is really that species (now referred to *Merobrachys*).

Most of the specimens from Queensland and Northern Australia have a small and faint infuscation on each shoulder, but even this is often absent. Length, 1·5–2·5 mm.

Specimens that have been in spirits, and dried with the wings stuck to the under surface of the elytra, often have a spotted appearance and the "waterlogging" is patchy.

Most specimens have a very narrow T mark due to the slight infuscation of the base of prothorax and elytra, and the suture.

Queensland: Brisbane, Cairns, Darnley Island, Dunk Island, Kuranda, Moa Island, Murray Island, Mount Tambourine, Palm Island, Stewart River; Northern Australia: Darwin, Groote Eylandt, Melville Island; New South Wales: Galston.

Many specimens are attracted to lights.

Several specimens have faint lateral infuscations on the elytra, and one has the elytra with rather wide marginal and sutural infuscations.

Two Darwin specimens are labelled as having been taken on flowers of *Jasminum*.

LITOCHRUS KOEBELEI Blackb.

Except for its positions in the two tables given by Blackburn of *Litochrus*, this species was not commented upon by him subsequent to its description, when it was noted as "*testaceus*" and "the uniform testaceous colour." When examining the type prior to its despatch to the British Museum I noted (in MS.): "The

(1) Blackburn, *Trans. Roy. Soc., S. Austr.*, xix, 1895, p. 208, and xxvi, 1902, p. 293.

type of *koebelei* looks much like the type of *tinctus*, and is probably the same species. Two specimens marked cotypes in the Blackburn collection are considerably larger, darker, and not uniformly coloured. I think they do not belong to the species." The type of *koebelei* also agreed with a specimen in my own collection (from the Blue Mountains, as was the type), which agrees with some specimens of the species identified by Blackburn as *L. brunneus* of Erichson. The specimens, wrongly marked as cotypes, are from Werris Creek, and are quite ordinary *P. victoriensis*.

LITOCHRUS NOTEROIDES Blackb.

Some cotypes and other specimens of this species agree quite well in colour with many of *L. tinctus*, but may be distinguished by the elytra more narrowed posteriorly. As with many specimens of *tinctus* and other pale species, the extreme base of the prothorax and elytra and the suture are infuscated, and appear as a very narrow T. It was noted as a variety of *Heterolitus thoracicus* (an Asiatic species) by Champion.

Queensland: Cairns, Dalrymple Island.

LITOCHRUS PULCHELLUS Blackb.

Fig. 85-87.

There are before me five specimens belonging to this form, of which four, from the Blackburn collection, are marked as cotypes. Of these two have the prothorax deeply infuscated, except at the sides, and two have it uniformly pale. Their pale elytral markings consist of a large median spot common to both, the apex and sides; on the fifth specimen, from Innisfail, the median spot is dilated, considerably reducing the black area. It was also recorded as a variety of *H. thoracicus* by Champion.

Queensland: Cairns, Innisfail.

LITOCHRUS LAETICULUS Blackb.

Fig. 88-102.

Var. *L. consors* Blackb.

Fig. 103-104.

A common, widely distributed, and very variable species. Blackburn considered that *L. consors* was distinct from it by its smaller size, elytral striation and markings; but the size of both forms varies from 1·5 to 2·2 mm. The real and apparent series of punctures also vary, being more noticeable on the dark forms than on the light ones, except when "waterlogging" occurs. There

were no specimens from Victoria in Blackburn's collection, but two from South Australia bear his label as *laeticulus*, and there are four cotypes of *consors* and other specimens labelled by him as that species. On the dark forms the pale markings tend to vanish, and on the pale side the only markings sometimes left are slight darkenings about the scutellum. It is in fact probable that some specimens with entirely dark elytra, and others with entirely pales ones, belong to the species, and are standing in collections under other names. The patterns given will show the great range of variation of the elytral markings and many more could have been given. In the variety *consors*, from Queensland and North Australia, the size is usually smaller than typical specimens from South Australia and New South Wales, and the paler parts of the elytra occupy a greater area, but some specimens are quite as large as southern ones, many of which also have the pale portions quite as extensive. The darker markings of the elytra vary in individuals from almost black and sharply defined to a slight reddish-castaneous, not much darker than the paler parts, and ill-defined, the shape of the markings being sometimes identical on dark and pale forms. Many specimens from Cairns, North-West Australia, and North Australia, have the elytral markings reduced to a reddish semicircle about the scutellum, the patch of exactly the same shades as the pronotum. They appear to almost connect the species with *L. brunneus*, as identified by Blackburn. The average size of tropical specimens is smaller than that of those from the southern parts of Australia, and the paler markings cover a greater area, but there are examples quite as large and dark from Queensland, as from southern parts. Of six specimens, mounted together, from Derby, three have faint "waterlogged" lines on the elytra (somewhat as on the specimen of *L. alternans* commented upon), on one specimen six on each elytron, on another four on each elytron, on the other four on the right and three on the left elytron. Such lines have a deceptive resemblance to striae, are quite distinct from some directions, and invisible from others. Some rather dark specimens from Lord Howe Island also have faint "waterlogged" lines on the pale parts of the elytra. Some of the pale varieties are very close in appearance to *L. tinctus*. Many specimens are attracted to lights.

Queensland: Brisbane, Cairns, Kuranda, Magnetic Island, Mount Tambourine, Palm Island, Rockhampton; New South Wales: Forest Reefs, Inverell, Mount Victoria, Richmond River, Sydney, Tamworth, Wentworth Falls; Victoria: Alps, Birchip; South Australia: Gawler, Lucindale, Mount Lofty, Mount Remarkable, Murray River, Nuriootpa, Ooldea, Port Lincoln, Second Creek; West Australia: Bunbury, Swan River; North West Australia: Derby, King's Sound, North Australia: Daly River, Groote Eylandt, Roper River; Lord Howe Island.

LITOCHRUS MACULATUS Blackb.

Fig. 105-111.

The distinctive feature of this species, according to Blackburn, is a large, triangular, pale spot, common to the middle of the elytra. The length was given as one line, but was stated to be variable. Those before me (including several specimens marked as cotypes) range in length, 1·8–2·5 mm. The usual colour of the upper surface is of a rather dark piceous-brown and slightly or moderately iridescent, varying to a rather dark chestnut. The large median spot appears to be always distinct, and is usually, but not always, sharply outlined, its base is usually cut straight across, but sometimes the dark suture encroaches on it, so that it appears as two spots connected at the suture (to a certain extent resembling *Parasemus doctus* on a small scale); on many specimens it is more or less distinctly connected along the suture with a pale apical portion. The pale parts on many specimens have a lined or seriately-punctate appearance, in certain lights, but this (except for the sutural stria), is partly or entirely due to "waterlogging", the true punctures being very small. The base of the prothorax is often narrowly pale. A specimen from the Dividing Range, that was standing in the Blackburn collection under this name, is almost uniformly castaneous, the elytral triangle and base of prothorax being scarcely paler than the adjacent parts. A specimen from Hobart has the markings faint but readily traceable; and owing to "waterlogging" appears to have quite distinct rows of punctures.

Queensland: Cairns; New South Wales: Armidale, Forest Reefs, Tamworth, Wentworth Falls; Victoria: Alps, Benalla, Dividing Range; Tasmania: Devonport, Hobart, Huon River, Launceston; South Australia: Ardrossan, Lucindale, Mount Lofty, Port Lincoln, Tumby; West Australia: Albany, Mount Barker, Swan River.

LITOCHRUS PLAGIATUS Blackb.

Fig. 112-114.

A large species, considered by Blackburn to be distinct from *L. maculatus* by its larger size, larger eighth joint of antennae and club, and "in the shape of the common red spot on its elytra (the front margin of which is triangularly concave, while in *maculatus* it is triangularly convex)." The markings, however, of *maculatus*, although often cut straight across or convex on the basal side, are fairly commonly concave there; I have seen, however, no specimen of *maculatus* as large as any of the eight specimens of *plagiatus* under examination, which range in length 3–4 mm.

Queensland: Brisbane, Cairns; New South Wales: Forest Reefs, Tamworth, Sydney; Victoria: Alps; South Australia: Mount Lofty.

LITOCHRUS LAUTUS Blackb.

Fig. 115-121.

Of the six specimens of this species referred to by Blackburn, five are now before me, and their markings are fairly close in appearance; but with a longer range it is seen that the median marking enlarges considerably, and the other parts may also be enlarged, although in enlarging they often lose in definition; on other specimens the markings decrease in size, and some of the smaller ones are unsatisfactorily close in appearance to *L. maculatus*. Of the three specimens from Sydney, mounted on the same card, one has markings much as on a Tamworth cotype, the others much as on specimens of *L. plagiatus*, and I think it quite possible that *maculatus* (1891, p. 96), *plagiatus* (1902, p. 289), and *lautus* (1902, p. 290), are really all forms of one species; the slight apparent differences in the striae and series of punctures on the elytra, and the comparative sizes of the eighth-eleventh joints of antennae (sometimes sexual) are not to be relied upon. Two specimens from near Sydney are almost black, with the elytral markings deep red (scarcely visible to the naked eye) although of normal shape.

Queensland: Cairns; New South Wales: Galston, Hastings River, Illawarra, National Park, Tamworth, Sydney; South Australia: Barton, Lucindale, Mount Lofty, Murray River.

LITOCHRUS MAJOR Blackb.

L. sparsus Blackb., var.

A large species, 3·5–4·0 mm., with the elytral punctures, for the family, unusually well defined; the obscurely paler margins of the elytra are sometimes distinct throughout, sometimes about the apex only. The intensity of infuscation of the prothorax (the margins appear to be always pale) also varies. I cannot regard *L. sparsus* as more than a dark variety of the species; a cotype agrees perfectly in structure with several specimens of *major*, and differs only in having the prothorax darker, witn the paler margins more obscure; on the elytra the sides and tips are scarcely if at all paler than the disc. Thirteen specimens quite evenly grade into each other. The differences mentioned by Blackburn are partly sexual and partly due to the angle of observation; the punctures on the elytral interstices vary somewhat in size and density, but the differences are individual rather than specific.

New South Wales: Blue Mountains; Victoria: Benalla, Dividing Range,

Melbourne; Tasmania: Brighton; South Australia: Adelaide, Balhannah, Kangaroo Island.

LITOCHRUS OBSCURICOLLIS Blackb.

As commented upon by Blackburn this species is "extremely like *Parasemus victoriensis*" in miniature. The elytra are uniformly of a bright castaneous or reddish-castaneous, the "disco postico umbris indeterminatis nigro-piceis," of the original description, being due to their wings showing through, owing to their attachment to the elytra of an occasional specimen that has been in spirits. On some specimens, owing to "waterlogging," faint lines are visible on the elytra, the lines being usually towards the base; but on one specimen there is a distinctly striated appearance, where the dark wings cause the surface to appear infuscated. One specimen, otherwise normal, has a fairly large discal reddish spot on the pronotum. The average size of Tasmanian examples is slightly larger than those from New South Wales.

New South Wales: Clifton, Sydney, Upper Williams River; Tasmania: Cradle Mountain, Frankford, Hobart, Huon River, Launceston, Waratah, Sheffield, Scottdale, Swansea, Ulverstone.

LITOCHRUS SYDNEYENSIS Blackb.

The sutural stria on each elytron of this species is distinct on the apical two-thirds, and in some lights may be faintly traced to the base; on the apical half of the elytra very faint striation may be traced in certain lights, but from most directions the entire elytra, except near the suture, appear to be impunctate. The type was described as piceous-black, and this is the colour of a cotype and many other specimens; but many have the elytra obscurely diluted with red, except that the suture is generally darker; on several only the apical fourth is obscurely diluted.

New South Wales: Galston, Mount Victoria, Sydney; West Australia: Bridgetown, Darling Ranges, Mount Barker, Swan River.

LITOCHRUS PERPARVUS Blackb.

Described as "niger, pronoto picescente" "and "its under surface of dark colour." The type was from Victoria; there were no specimens from Victoria in the Blackburn collection, when it was acquired by the South Australian Museum, but two Tasmanian ones bear a label as *perparvus*. Numerous Tasmanian specimens that appear to belong to the species have the under surface dark, distinctly darker than the legs, but not black. Some New South Wales ones also have the under surface much darker than the legs (which are almost flavous), but hardly

more than a moderately dark brown; their average size is slightly smaller than Tasmanian ones. A specimen from South Australia closely resembles the New South Wales ones. In general appearance they are close to *L. sydneyensis*, but the seriate punctures of the elytra are much more distinct, fairly strong for the genus.

New South Wales: Mount Kosciusko, Richmond River, Sydney, Upper Williams River, Wentworth Falls; Victoria: Dividing Range; Tasmania: Beaconsfield, Hobart, Huon River, Kelso, Swansea, Ulverstone; South Australia: Karoonda to Peebinga.

LITOCHRUS MARITIMUS Blackb.

Although on each elytron of a cotype of this species only two striae near the suture are at all well defined, other faint ones may be seen in certain lights towards the apex. The under surface is usually dark brown, but occasionally is no darker than the legs.

Queensland: Bribie Island, Cairns; New South Wales: Sydney; Victoria: Glenelg River; South Australia: Kangaroo Island, Mount Gambier, Mount Lofty.

LITOCHRUS FRIGIDUS Blackb.

There were two specimens standing in the Blackburn collection under this name, and one was labelled as a cotype (although in the original description the species was described from "a single example embedded in snow on one of the higher mountains"); the quasi-cotype is without antennae, the other, from the Victorian Alps, agrees well with the description. A single specimen of the species was taken by myself at Frankford (Tasmania). The species may be distinguished from many others very similar in appearance by its black club.

PARASEMUS FULGIDUS sp. nov.

Fig. 33.

Metallic blue, elytra purple and brightly iridescent, parts of under surface blackish, abdomen and legs obscure reddish-brown, labrum, antennae (club black), and palpi reddish-flavous.

Head with minute but fairly sharply-defined punctures, becoming still more minute on prothorax. Each elytron with sutural stria well defined to about basal third and vaguely traceable to base, elsewhere with feeble series of minute punctures, more distinct about sides and apex (where they are irregular) than middle, but nowhere sharply defined. Length, 3·2–3·4 mm.

Queensland: Brisbane (T. McGregor).

A large, brilliant species, at first glance appearing to belong to *Phalacrus*,

but with bispinose hind tibiae and comparatively small scutellum. The under surface is somewhat variable in colour, the sterna is sometimes entirely black, but on one specimen the process between the middle legs is distinctly reddish; the tibiae are somewhat darker than the femora and tarsi. The second joint of the hind tarsi is longer than the first, but a high power is needed to see the proportions clearly.

PARASEMUS MELAS sp. nov.

Fig. 34.

Black, tip of clypeus, labrum, antennae, palpi, under surface, and legs reddish-castaneous.

Head and prothorax with minute punctures. Each elytron with sutural stria distinct to about basal fourth and faintly traceable to base; with regular rows of small but sharply-defined punctures, traceable almost to base, the interstices with numerous smaller punctures. Length, 2·8–3·1 mm.

South Australia (Blackburn's collection), Adelaide (N. B. Tindale), Mount Lofty (S. H. Curnow and J. G. O. Tepper); West Australia: Geraldton (A. M. Lea); Tasmania: Hobart (C. E. Cole and Lea).

In general appearance fairly close to *Litochrus perparvus*, but with the second joint of the hind tarsi slightly longer than the first, as in *Parasemus*. The upper surface is shining, but not at all iridescent, the tips of the elytra are obscurely diluted with red. In some lights the elytra appear to have close-set rows of minute punctures, with rows of larger ones at regular intervals, but the punctures on the interstices are really irregular and become denser posteriorly.

PARASEMUS NOCTIVAGUS sp. nov.

Fig. 35-36.

Black or blackish, front of head, sides of prothorax, and tips of elytra obscurely diluted with red; under surface (the metasternum black or dark brown), legs, antennae, and palpi castaneous.

Head and prothorax with very minute punctures. Each elytron with sutural stria distinct to basal fourth, but not traceable to base; with regular rows of small punctures, also not traceable to base, the interstices with very minute punctures. Length, 2·0–2·2 mm.

Queensland: Cairns, Mount Tambourine (A. M. Lea).

Structurally close to *P. obsoletus*, but darker, less convex, and with more distant punctures, which in some lights are fairly distinct on the elytra. Several of the specimens were obtained at lights.

PARASEMUS AUSTRALIAE sp. nov.

Fig. 37-39.

Dark castaneous-brown, scutellum and suture obscurely darker, under sur face, antennae, palpi, and legs paler.

Head and prothorax with scarcely visible punctures. Each elytron with sutural stria distinct to basal fourth, but not to base itself; with rows of minute

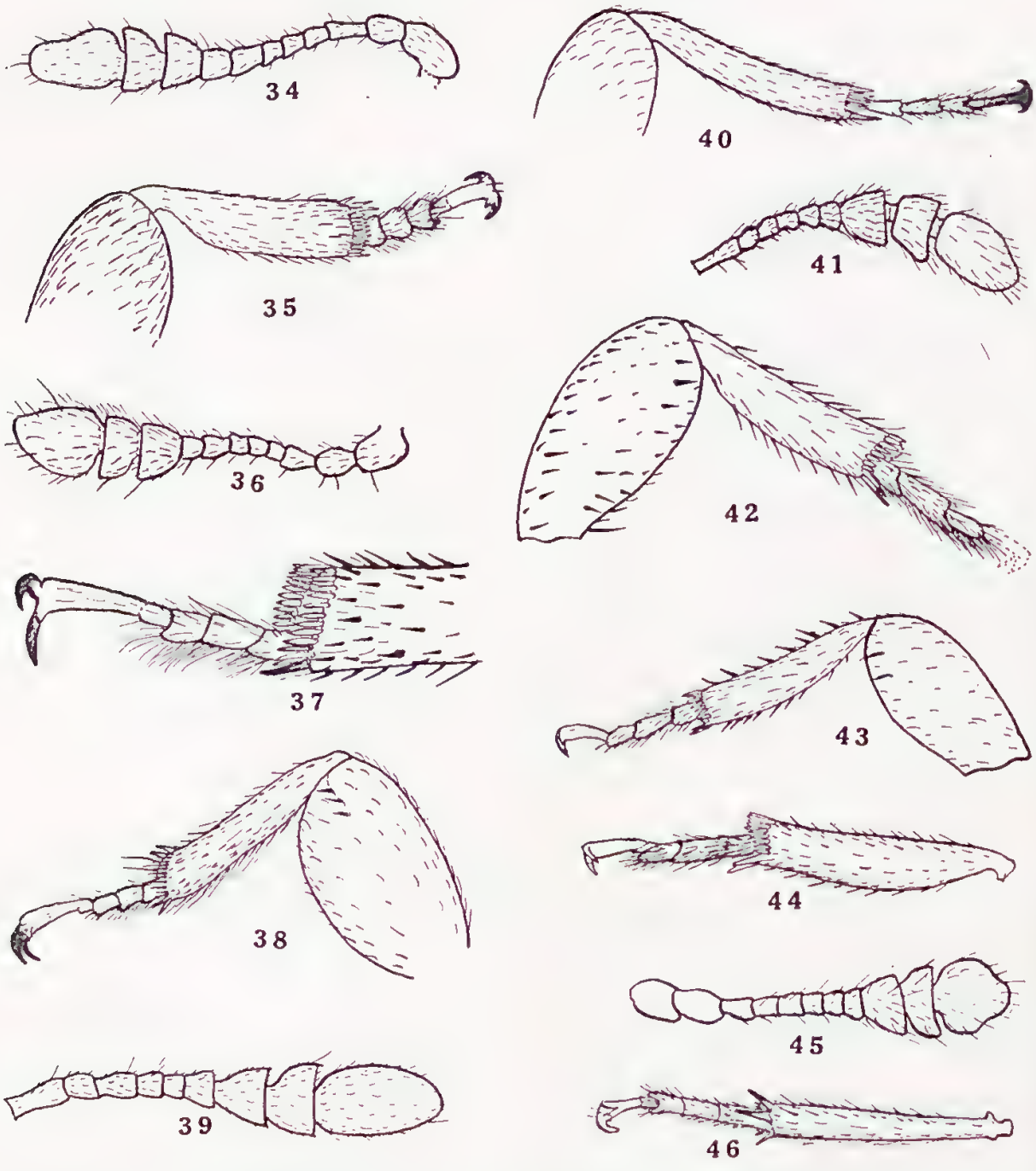

Fig. 34–46. 34, *Parasemus melas* Lea, antenna. 35, *P. noctivagus* Lea, hind leg. 36 *ditto*, antenna. 37, *P. australiae* Lea, hind leg. 38, *ditto*, front leg. 39, *ditto*, antenna. 40 *P. tasmaniae* Lea, hind leg. 41, *ditto*, antenna. 42, *P. pallidicornis* Lea, hind leg. 43, *P. apicipennis* Lea, hind leg. 44, *P. terraereginae* Lea, hind leg. 45, *P. haploderus* Lea, antenna 46, *ditto*, hind leg.

punctures, fairly distinct in some lights, but not traceable to base; the interstices scarcely visibly punctate. Length, 2·2–2·8. mm.

Queensland: Bluff, Cairns; New South Wales: Sydney (A. M. Lea), Bogan River (J. Armstrong); Tasmania: Hobart, Huon River, Ulverstone; South Australia: Kangaroo Island, Morgan, Tarcoola (type); West Australia: Bridgetown, Geraldton, Swan River (Lea).

A rather wide, oblong-elliptic, and not very convex species; its outlines, although not very different from other species, are sufficiently distinctive to render specimens easily recognizable when placed side by side. Some of the mainland specimens are paler than others, being almost of a bright castaneous; the Tasmanian are mostly larger than the others, and have slightly more distinct punctures, their upper-surface is usually black or blackish, but usually the suture is darker than the adjacent surface.

PARASEMUS TASMANIAE sp. nov.

Fig. 40-41.

Black or blackish-piceous, under surface piceous-brown or castaneous-brown, legs, antennae (club infuscated), and tarsi testaceo-flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria distinct to basal fourth, but not traceable to base, and with a shorter second stria; elsewhere with series of minute punctures, more distinct on apical slope than elsewhere. Length, 1·6–1·8 mm.

Tasmania (J. E. Philp), Zeehan (Aug. Simson), Bruni Island, Hobart, Huon River, King Island, Mole Creek, Mount Wellington (including summit), New Norfolk (A. M. Lea).

An oblong-elliptic species, with the upper-surface black, but not a deep black, and with the apical slope of elytra usually obscurely diluted with brown, the front of the head is also narrowly pale. In certain lights the two fine striae on each side of the suture are fairly distinct, the series of punctures are very fine, and the interstices appear to be impunctate. A specimen evidently belonging to this species, from the Simson collection, bears a note by Blackburn, "Seems to be very small dark *Litochrus frigidus* Blackb."; its legs and antennae, however, are entirely concealed; on specimens with antennae clearly visible the club is seen to be infuscated but not black, and the tarsi are certainly not those of a *Litochrus*.

PARASEMUS PALLIDICORNIS sp. nov.

Fig. 42.

Deep shining black, under surface castaneous-brown, antennae, palpi, and tarsi paler.

Head and prothorax scarcely visibly punctate. Each elytron with sutural striae almost to base, and with a shorter adjacent one; with rows of minute punctures. Length, 1·5 mm.

North Australia: Roper River (N. B. Tindale); Queensland: Cairns (F. P. Dodd and A. Koebele).

In general appearance close to the preceding species, but club no darker than the rest of the antennae. In some lights the series of punctures on the elytra, although very small, are quite distinct, they may even be traced about the scutellum.

PARASEMUS APICIPENNIS sp. nov.

Fig. 43.

Blackish, front of head and tips of elytra obscurely diluted with red; under surface dull brown, antennae (club dark), palpi, and legs flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria distinct to basal fourth and faintly traceable to near base; with rows of minute punctures, except about scutellum. Length, 1·3 mm.

North Queensland (Blackburn's collection): Cairns.

A narrow blackish species (narrower than *P. tasmaniae*), with basal joint of hind tarsi distinctly shorter than the second. The specimen from Cairns has the apical half of elytra obscurely brownish.

PARASEMUS TERRAEREGINAE sp. nov.

Fig. 44.

Deep shining black, prothorax, and elytra with very narrow brownish margins, under surface brown or piceous-brown, antennae (club slightly infuscated), palpi, and legs flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria distinct to basal fourth and faintly traceable to base; with rows of very minute punctures, visibly only in certain lights. Length, 1·4 mm.

Queensland: Blackall Ranges (A. M. Lea).

In general appearance close to *P. tasmaniae*, but with only one stria on each elytron near suture. Narrower than the preceding species, and prothorax and elytra with very narrow pale margins.

PARASEMUS HAPLODERUS sp. nov.

Fig. 45-46.

Castaneous, antennae, palpi, and legs paler.

Head and prothorax scarcely visibly punctate. Each elytron with sutural

stria fairly distinct to basal fourth and traceable from there nearly to base, elsewhere with series of scarcely visible punctures. Length, 1·5 mm.

New South Wales: Sydney, Galston (D. Dumbrell and A. M. Lea), Captains Flat, Wentworth Falls (A. Simson); West Australia: Albany (R. Helms), Swan River, Darling Ranges (Lea).

Structurally fairly close to *P. suturellus*, but without the paler suture of that species; consistently paler than *P. tasmaniae*, and with only one stria on each elytron. Most of the specimens, although shining, are of a rather dull castaneous, sometimes picco-castaneous. The first joint of the hind tarsi is slightly shorter than the second, but it was difficult to see the suture between them clearly, even under a high power, owing to the clothing.

PARASEMUS IRIDIPENNIS sp. nov.

Fig. 47-48.

Black, the elytra with a bluish iridescence, antennae, palpi, and legs reddish-flavous, the femora darker.

Head and prothorax scarcely visibly punctate. Each elytron with a fine sutural stria, traceable almost to base; with rows of minute punctures fairly distinct on apical slope and disappearing before base. Length, 2 mm.

North Queensland (Blackburn's collection), Kuranda (F. P. Dodd).

A deep black, iridescent species, the sides of the prothorax no paler than the middle; although one of the specimens is less iridescent than the others and the apical third of its elytra is obscurely diluted with brown; in certain lights the apical half of the elytra appears to be very finely striated. The basal joint of the hind tarsi is distinctly shorter than the second.

PARASEMUS PALLENS sp. nov.

Fig. 49-50, 122.

Castaneous or flavo-castaneous, antennae and legs slightly paler.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria moderately distinct to basal fourth, but not to base; with rows of minute punctures, fairly distinct in certain lights on apical slope but scarcely visible elsewhere. Length, 1·9–2·1 mm.

New Guinea: Wareo, to light (Rev. L. Wagner); Papua: Mount Lamington, abundant (C. T. McNamara).

Although at first glance the upper surface appears to be of a uniform shade of colour, on close examination the base of the prothorax is usually seen to be narrowly paler. Two specimens are unusually pale, probably from immaturity.

The two basal joints of the hind tarsi are rather short, the first shorter than the second.

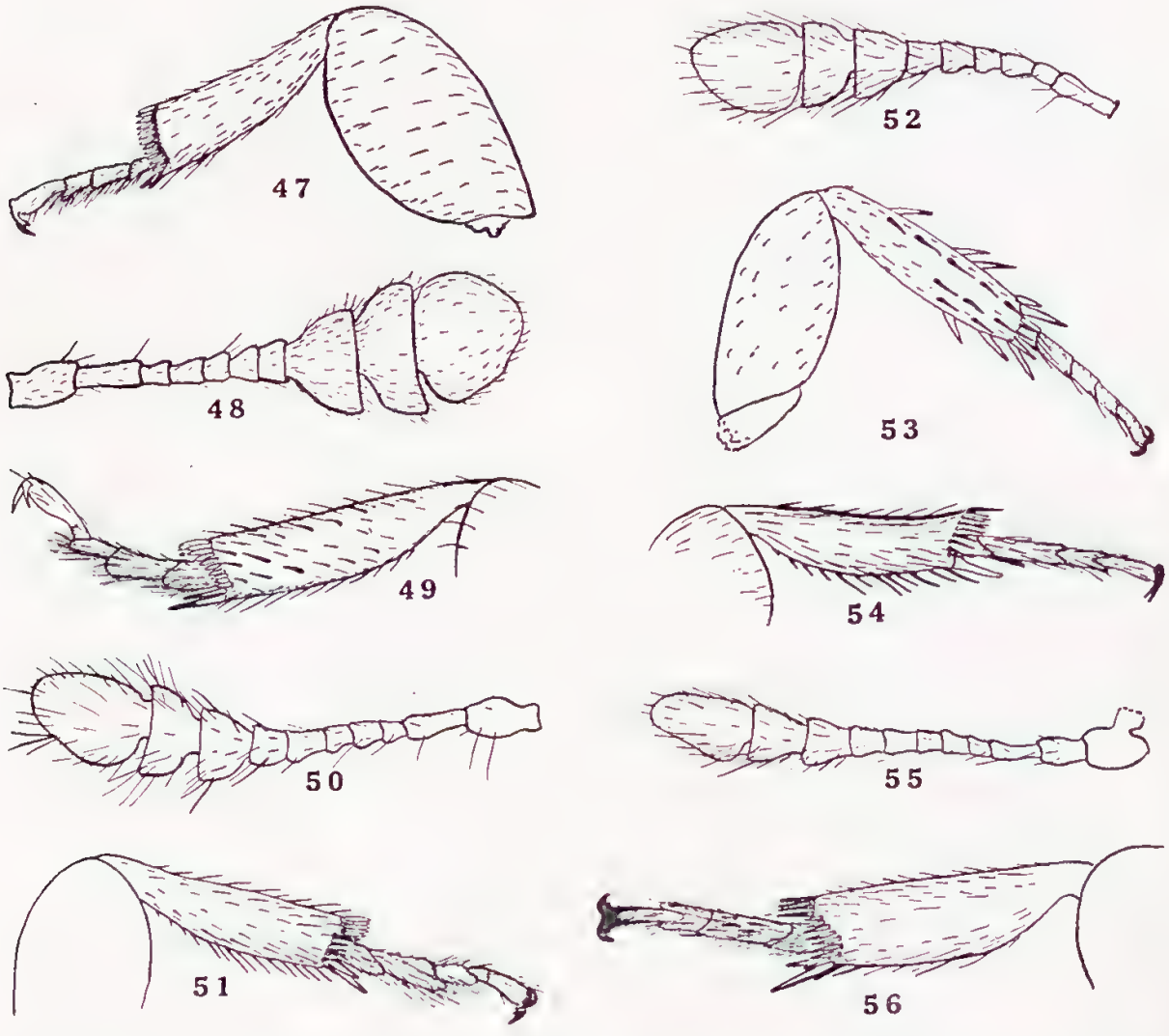

Fig. 47–56. 47, *Parasemus iridipennis* Lea, hind leg. 48, *ditto*, antenna. 49, *P. pallens* Lea, hind leg. 50, *ditto*, antenna. 51, *P. montanus* Lea, hind leg. 52, *ditto*, antenna. 53, *P. parvopallidus* Lea, hind leg. 54, *P. compsus* Lea, hind leg. 55, *ditto*, antenna. 56, *P. moestus* Lea, antenna.

Two specimens differ from the typical form in having an infuscation on each elytron, beginning rather narrowly near each shoulder and extending and dilating obliquely to near the suture at the apical fourth (fig. 122).

PARASEMUS MONTANUS sp. nov.

Fig. 51-52.

Castaneous-brown with a slight bronzy gloss, antennae, palpi, and legs paler. Head with very minute punctures, becoming still smaller on prothorax.

Each elytron with sutural stria distinct to basal fourth and faintly traceable to base itself; with rows of minute punctures, the interstices very minutely punctate. Length, 2 mm.

Papua: Mount Lamington (C. T. McNamara).

In some lights the elytral punctures are fairly distinct on the apical slope, but they are very minute; from a large space about the scutellum they appear to be entirely absent. The basal joint of the hind tarsi is distinctly shorter than the second.

PARASEMUS PARVOPALLIDUS sp. nov.

Fig. 53.

Testaceo-flavous, antennae, palpi, and legs paler.

Head and prothorax scarcely visibly punctate, the former with a large, shallow, interocular depression. Each elytron with sutural stria distinct on apical half and traceable almost to base; with rows of minute but fairly distinct punctures. Length, 1·2 mm.

Queensland: Cairns district, three specimens from fallen leaves (A. M. Lea).

A minute pale species, with more distinct punctures on elytra than on *P. mitchelli;* in addition to the smaller size distinct from *Litochrus tinctus* and *noteroides* by the larger and more distinct punctures on elytra. The first joint of the hind tarsi is shorter than the second, but the sutures of the three basal joints are inconspicuous, except under a high power.

Two specimens from Victoria (Dandenong Ranges, C. French, sen.) agree well with the types, except that the head is without the shallow depression.

PARASEMUS COMPSUS sp. nov.

Fig. 54-55.

Bright castaneous, base of prothorax and suture very narrowly blackish, antennae, palpi, and legs, and sometimes the abdomen, flavous.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria distinct to basal fourth, and traceable almost to base; with rows of fairly distinct punctures, the interstices with minute punctures. Length, 2·5 mm.

West Australia: Beverley (type), Swan River (A. M. Lea), Geraldton (J. Clark); South Australia: Minnipa (H. A. Johnson); Victoria: Grampians, in October (F. E. Wilson); New South Wales: Mittagong, Clarence River (Lea), Galston (D. Dumbrell); Queensland: Cairns (F. P. Dodd and Blackburn's collection), Bundaberg.

Structurally fairly close to *P. victoriensis,* but head and prothorax no darker

than elytra, and general colour more brightly castaneous; it is consistently larger and brighter than *P. obsoletus; P. pallidus* is smaller and narrower. In some lights the series of elytral punctures are well defined, and the punctures between them appear also to be seriate in arrangement, but they become confused about the apex. On several specimens the elytra appear to have two small subapical infuscations, due to the dark wings showing through. Several specimens are slightly iridescent. The first joint of the hind tarsi is shorter than the second, but even under a high power its junction with that joint is not very distinct.

PARASEMUS MOESTUS sp. nov.

Fig. 56-57.

Black, prothorax and suture obscurely diluted with red, under surface dull brown, antennae, palpi, and legs paler.

Head and prothorax very minutely punctate. Each elytron with sutural stria fairly distinct on apical half, but not traceable to base; with rows of minute but rather sharply impressed punctures, but absent from a fairly large scutellar space. Length, 2 mm.

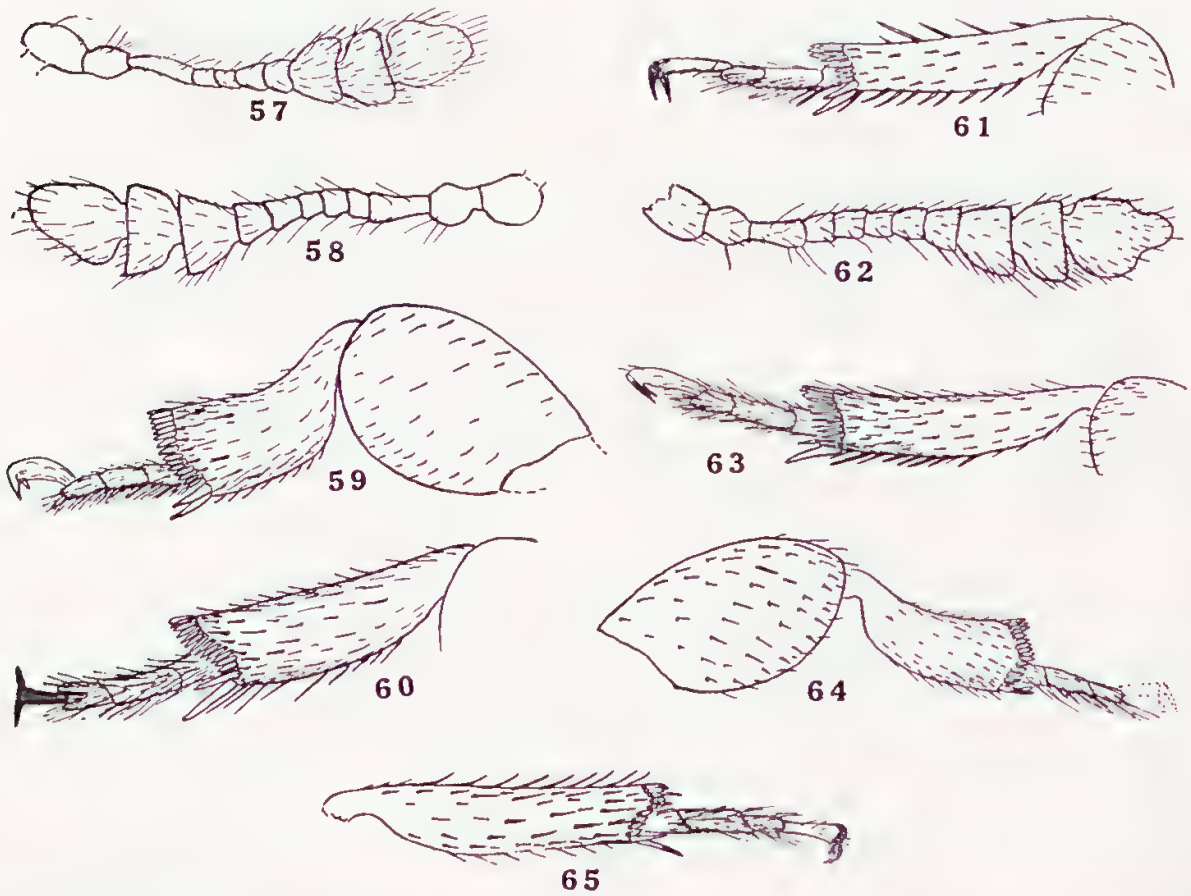

Fig. 57–65. 57, *Parasemus moestus* Lea, hind leg. 58, *P. altus* Lea, antenna. 59, *ditto*, middle leg. 60, *ditto*, hind leg. 61, *P. rufosuturalis* Lea, hind leg. 62, *P. obliquiniger* Lea, antenna. 63, *ditto*, hind leg. 64, *P. bimaculiflavus* Lea, middle leg. 65, *ditto*, hind leg.

Papua: Mount Lamington (C. T. McNamara).

The outlines are much like those of *Litochrus caeruleotinctus*, but the elytra, although shining, are not iridescent, and the hind tarsi are different, the basal joint being distinctly shorter than the second. At first glance the upper surface appears to be entirely black; the metasternum is the darkest part of the under surface. The series of punctures on the elytra, although minute, are fairly distinct in certain lights, the interstices appear to be impunctate, except on the apical slope.

PARASEMUS ALTUS sp. nov.

Fig. 58-60.

Bright castaneous, under surface, antennae, palpi, and legs paler.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria fairly distinct to basal third, but not traceable to base; with rows of minute punctures. Length, 2·0–2·2 mm.

Papua: Mount Lamington (C. T. McNamara).

An unusually convex species; the colour and outlines are much as those of *P. compsus*, but the species is distinctly more convex. The series of elytral punctures, although minute, are fairly distinct in certain lights and rather sharply defined; the interstices are impunctate, except on the apical slope. The basal joint of the hind tarsi is stouter and shorter than the second.

PARASEMUS RUFOSUTURALIS sp. nov.

Fig. 61, 123.

Reddish-castaneous, under surface (the metasternum slightly darker than the other parts), antennae, palpi, and legs paler, each elytron infuscated, except on the sides and on a rather wide sutural space.

Head and prothorax scarcely visibly punctate. Each elytron with sutural stria fairly distinct to basal third and traceable to near base; with series of minute but fairly distinct punctures. Length, 2 mm.

Queensland: Bowen (Aug. Simson).

In general appearance fairly close to *P. discoideus*, but much less convex (this is very distinctly so from the sides), the elytra are slightly longer, and their central mark differs in shape, although variable on both species. The darker parts of the elytra are not sharply defined, and vary with the point of view, but the suture and sides are distinctly paler than the dark parts, and paler than most of the pronotum. In some lights the series of punctures are fairly distinct and the interstices are seen to have punctures, which may also appear to be in series,

although finer than the regular ones, but about the apex they are irregular. The hind tarsi are rather short, with the basal joint shorter than the second.

PARASEMUS OBLIQUINIGER sp. nov.

Fig. 62-63, 124-126.

Dark brown, front of head and sides of prothorax paler, elytra bright reddish-castaneous, an oblique black mark on each; under surface pale reddish-castaneous, antennae, palpi, and legs paler.

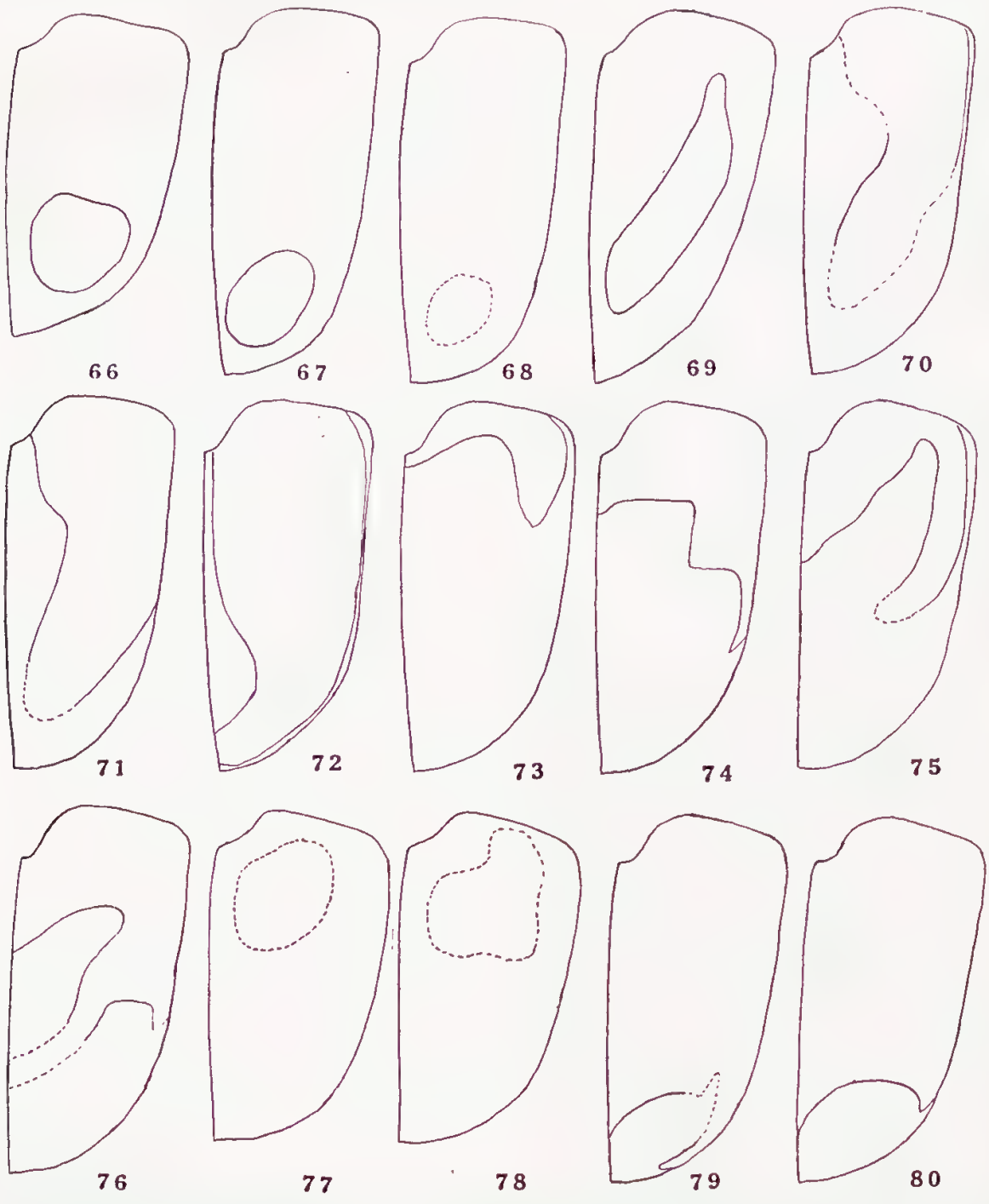

Fig. 66–80. Elytral markings. 66, *Litochrus blackburni* Lea. 67, 68, *L. flavonotatus* Lea. 69, *L. v-niger* Lea. 70, 71, *L. majorinus* Lea. 72, *L, divergens* Lea. 73–76, *L. basipennis* Lea. 77, 78, *L. binotatus* Lea. 79, 80, *L. apiciflavus* Lea.

Head with dense and minute punctures, becoming slightly larger and sparser on prothorax. Elytra with two parallel striae on each side of suture, traceable almost to base; with regular rows of small but distinct punctures, the interstices with punctures as on prothorax. Length, 2·5–3·0 mm.

Victoria: Ararat (type), Bright (H. W. Davey), Dandenong Ranges (C. French, sen.); New South Wales: Sydney (Blackburn's collection), Forest Reefs (A. M. Lea).

The elytra are more pointed than in *P. victoriensis,* and the dark mark on each is always present but the colours are otherwise much the same; the markings are as on some specimens of *P. discoideus,* but the body is larger and the elytra are more pointed. The prothorax is sometimes almost black, and sometimes hardly more than a rather dark reddish-brown; the black or blackish mark on each elytron usually begins some distance behind the shoulders and dilates hindwards to near the suture at the apical third, it is twice as long on some specimens as on others. The prothoracic punctures, although minute, are quite sharply defined in certain lights. The basal joint of the hind tarsi is shorter and stouter than the second.

PARASEMUS BIMACULIFLAVUS sp. nov.

Fig. 64-65, 127.

Deep shining black, sides of prothorax very narrowly reddish, each elytron with a fairly large, rounded, flavous median spot; under surface, antennae, palpi, and legs castaneous.

Head and prothorax with scarcely visible punctures. Each elytron with sutural stria fairly distinct to basal third, and faintly traceable to near base; with series of minute punctures, the interstices with very minute punctures, becoming stronger but more confused about apex. Length, 2 mm.

Queensland: Cairns district (A. M. Lea). Unique.

Very distinct by the bimaculate elytra.

PARASEMUS QUADRIMACULATUS sp. nov.

Fig. 128.

Blackish, sides of prothorax very narrowly paler, each elytron with an oblique flavous spot at the basal third and an irregular apical one, under surface castaneous-brown, antennae, palpi, and legs slightly paler.

Head and prothorax with very minute punctures. Each elytron with sutural stria distinct to basal fourth and traceable almost to base; with regular rows of minute but fairly sharp punctures, the interstices with very minute punctures, becoming confused posteriorly. Length, 2·5 mm.

Papua: Mount Lamington (C. T. McNamara). Unique.

The elytra are slightly iridescent, and the spots are sharply defined but not quite symmetrical. No part of the type was broken off for examination in Canada balsam, but under the microscope the basal joint of the hind tarsi was seen to be shorter than the second.

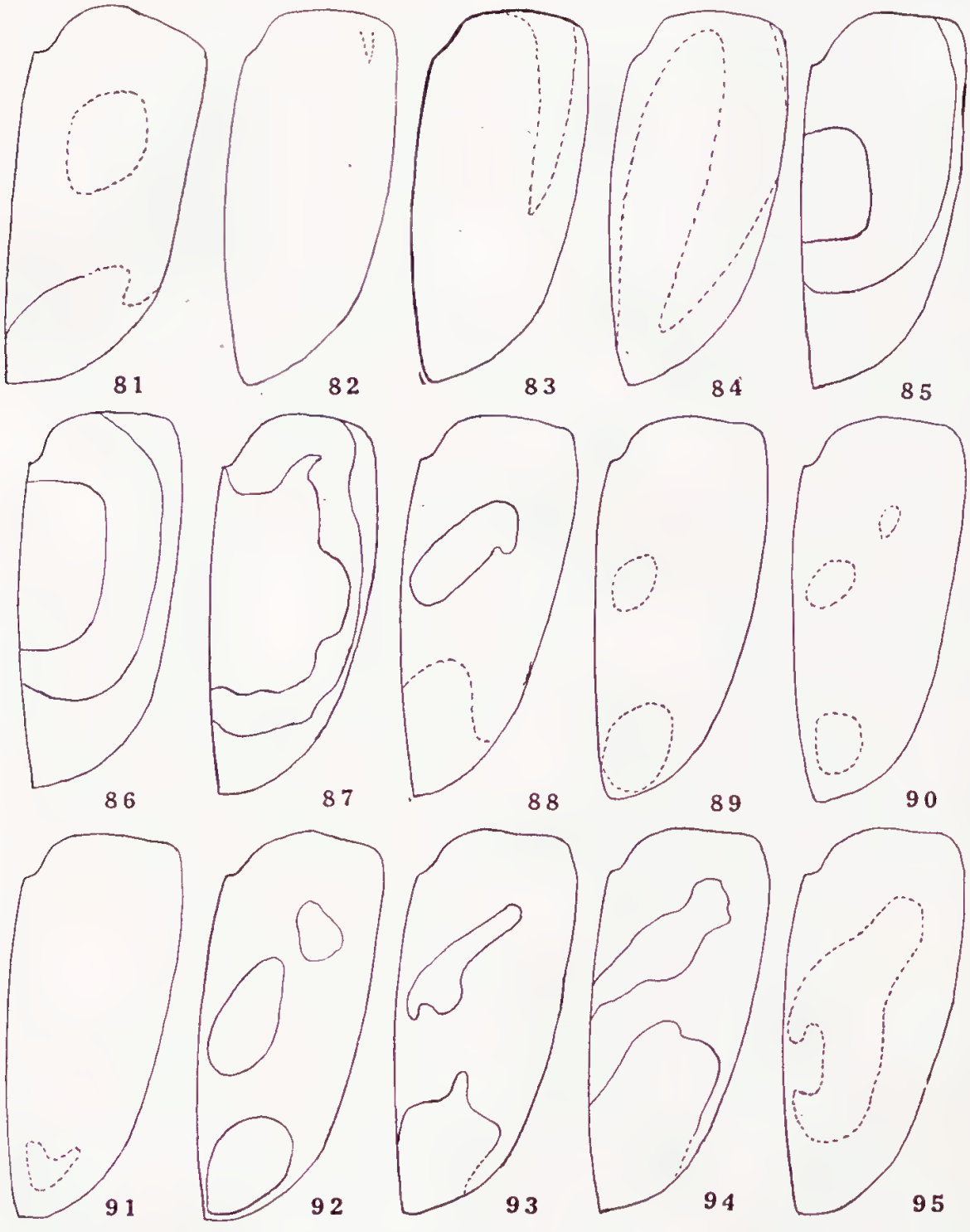

Fig. 81–95. Elytral markings. 81, *Litochrus apiciflavus* Lea. 82–84, *L. brunneus* Er. 85–87, *L. pulchellus* Blackb. 88–95, *L. laeticulus* Blackb.

PARASEMUS PALLIDUS Blackb.

A specimen labelled as a cotype of this species has hind legs damaged. In colour and general appearance it agrees well with many of *L. tinctus*, but the two species should be distinct by the proportions of the hind tarsi. On comparing it with the type some years ago it was noted as being somewhat larger and more brightly coloured. Two other specimens, that appear to belong to the species, are from Sydney and Mount Lofty.

PARASEMUS ALPICOLA Blackb. *(Litochrus).*

I noted that the type of this species was a pale, wide, small specimen, in general appearance almost approaching *Phalacrinus.*

PARASEMUS MODESTUS Blackb.

A small pale species, in colour agreeing with many specimens of *L. tinctus*, but more ruddy than most of them, also more compact, more convex, and with stronger punctures on elytra. Seen from the sides the elytra appear to be at their greatest elevation near the scutellum.

PARASEMUS OBSOLETUS Blackb.

Although more convex behind the scutellum than usual in the genus, the apparent convexity depends to a certain extent on the angle of attachment to the prothorax. The colour is usually of a livid-brown ("fusco-piceus" of the description), the prothorax scarcely, if at all, paler on the sides than on the disc.

Queensland: Bribie Island, Bundaberg, Cairns, Hamilton; New South Wales: Clarence River, Sydney.

PARASEMUS MITCHELLI Blackb.

A minute species, with the entire margins obscurely paler than the general surface.

Queensland: Cairns. Darnley Island, Mount Tambourine; New South Wales: Richmond River; New Guinea: Finsch Haven, on *Casuarina.*

PARASEMUS ADUMBRATUS Blackb.

In size and general appearance much like specimens of *Litochrus major*, but wider and with different legs. Several specimens from Cairns are rather bright reddish-castaneous, the prothorax infuscated, with rather wide, pale markings on each elytron, with an obscure infuscation and in parts brightly iridescent. Two others from Kuranda are almost black, with the base very narrowly, and

sides of prothorax and suture of elytra obscurely paler. Blackburn said that the species differed from *P. lateralis* and *victoriensis* "inter alia multa by the form of the clypeus"; this being described as "subelongato antice sat angustato, ad apicem subtruncato." A cotype of the species has the clypeal suture faintly marked at the sides and scarcely traceable elsewhere, the clypeus itself about

Fig. 96–110. Elytral markings. 96–102, *Litochrus lacticulus* Blackb. 103, 104, *L. lacticulus* var. *consors* Blackb. 105–110, *L. maculatus* Blackb.

four times as wide as long; on several specimens its colour is slightly paler than the part behind it; but I cannot regard it as distinctly different from the clypeus of *victoriensis*.

Queensland: Cairns, Kuranda, Mount Tambourine; New South Wales: Galston; Victoria: Dividing Range; South Australia: Mount Lofty.

PARASEMUS VICTORIENSIS Blackb.

The type of this species was described as testaceous-red, the prothorax, except for the sides and base, darker. The species is very common in parts of Eastern Australia, and most of the specimens before me have the elytra of a rather bright and uniform chestnut-red colour, the prothorax conspicuously darker, except at the base and sides; the elytra, however, are sometimes paler; on some specimens the upper surface is uniformly pale.

Queensland: Cairns, Goodna, Mount Tambourine; New South Wales: Dorrigo, Galston, Forest Reefs, Jenolan, Queanbeyan, Sydney, Tamworth, Wentworth Falls, Werris Creek; Victoria: Alps, Dividing Range; South Australia: Lucindale.

PARASEMUS SUTURELLUS Blackb.

Referred originally to *Litochrus*, but transferred in 1895 to *Parasemus*, and tabulated with the species of that genus, but the colour not mentioned, except in the original description, where it was noted as piceous or reddish-piceous, with the prothoracic and elytral margins, including the suture, testaceous. The colour varies from almost black, with the base of prothorax and suture and sides of elytra conspicuously paler, almost flavous, to a rather dingy reddish-brown, with the paler parts hardly indicated. On brightly coloured specimens the pale markings form a conspicuous narrow T. On some large dark and small dark specimens from West Australia the only parts of the base of prothorax that are pale are the external margins; their elytra are entirely dark, except that parts of the external margins are very narrowly pale. There are similar specimens from South Australia, New South Wales, Tasmania, and Queensland, as well as the typical forms, and they have the elytral punctures quite as strong. A specimen, from Cairns, has the elytra black, with a bright bluish iridescence, the outer margins are very narrowly pale, but not the suture; the base of the prothorax is very narrowly pale, the sides more widely so. Some of the very pale specimens are coloured much as *L. tinctus*, but they are less oval in shape, and even on the palest specimens the base of the prothorax is still paler. The length ranges 1·8–2·2 mm.

Queensland: Cairns, Mount Tambourine; New South Wales: Como, Dorrigo,

Forest Reefs, Sydney; Tasmania: Beaconsfield, Bridport, Hobart, Kelso, Launceston, Mount Wellington, Southport, Waratah; South Australia: Barton, Gawler, Kangaroo Island, Karoonda to Peebinga, Lucindale, Mount Lofty, Murray River, Ooldea, Port Lincoln; West Australia: Albany, Beverley, Bun-

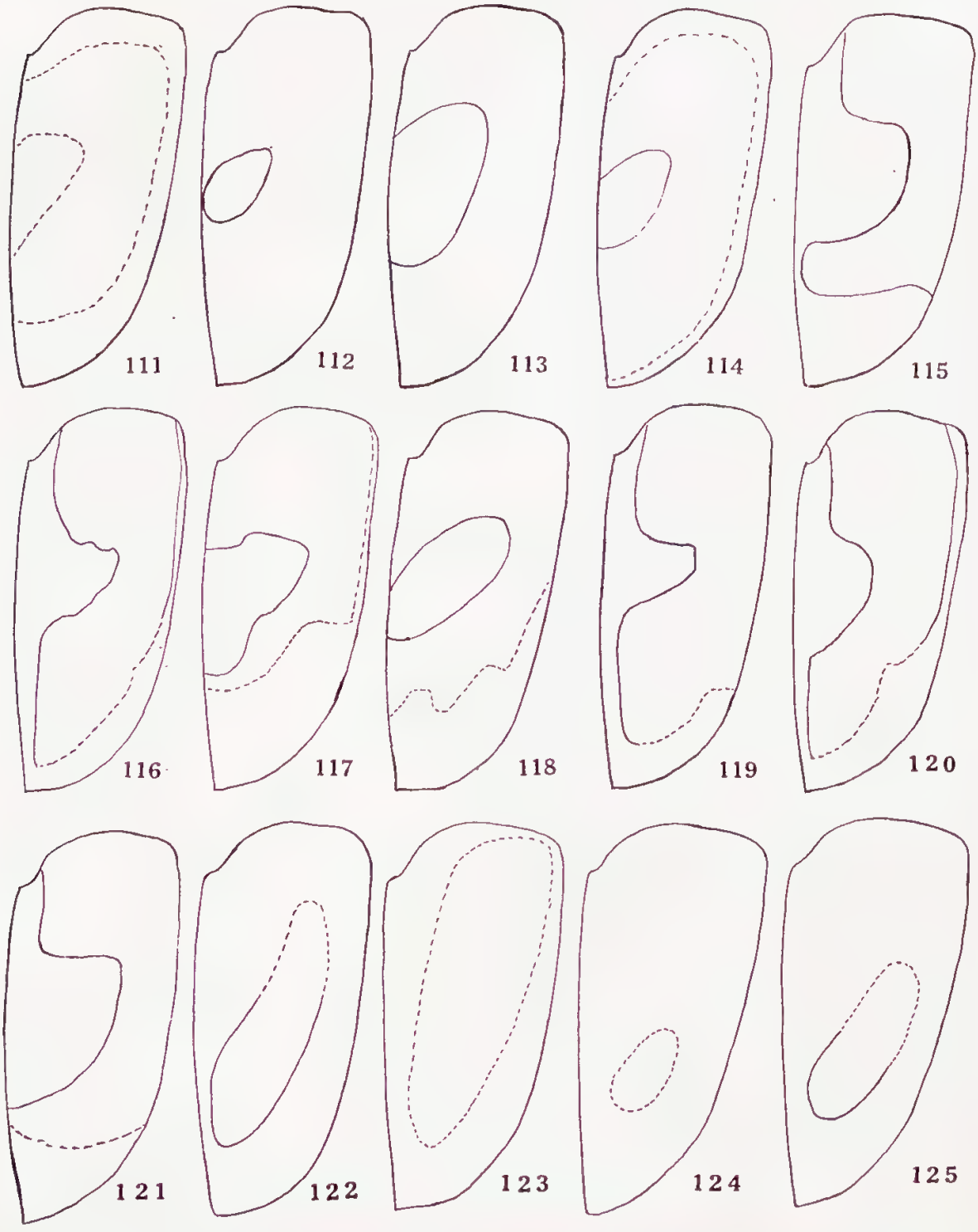

Fig. 111–125. Elytral markings. 111, *Litochrus maculatus* Blackb. 112–114, *L. plagiatus* Blackb. 115–121, *L. lautus* Blackb. 122, *Parasemus pallens* Lea, var. 123, *P. rufosuturalis* Lea. 124, 125, *P. obliquiniger* Lea.

bury, Garden Island, Geraldton, Mount Barker, Rottnest Island, Swan River, Vasse.

PARASEMUS DISCOIDEUS Blackb.

Fig. 129-133.

Twelve specimens, including two cotypes, of this species before me are all from the Cairns district; they vary somewhat in the extent and intensity of the infuscations of the elytra. The hind angles of the prothorax are more produced over the shoulders than is usual in the family. On one specimen the whole of the upper surface, to the naked eye, appears to be uniformly black, but on close examination the sides of the prothorax and a large discal area of the elytra are seen to be obscurely paler; on another specimen only a comparatively small humeral area is rather lightly infuscated.

PARASEMUS TORRIDUS Blackb.

Fig. 134-139.

This species was described as being "supra piceus plus minusve rufescens," and in the table was placed with those having "elytra without sharply-defined markings." There are four of the original specimens before me, three bearing the number 5945 and two with cotype labels; each of the latter is of a dark red, each elytron with a blackish area occupying most of the surface, on one specimen (less on the other) with the suture and sides of the same shades of red as the prothorax; the third specimen has the elytra entirely dark and brightly iridescent (much as on many specimens of *P. alternans*, except that they are wider in proportion); the fourth specimen is smaller than the others and entirely pale reddish-brown, approaching in colour some of the darker ones of *L. tinctus*. There are many other specimens under examination, some of which have well-defined markings, although the reddish suture and sides of the elytra are sometimes almost as dark as the disc; the prothorax also is sometimes almost black, the sides, or sides and base, narrowly excepted or not. The stria close to the suture, really terminates some distance from the base, as may be quite distinctly seen from the sides, but when viewed directly from above, on some specimens, owing to "waterlogging" it appears to extend to the base itself. One specimen from Mount Tambourine has the upper surface almost black, the sides and base of elytra narrowly, and sides of the suture of elytra rather widely, obscurely reddish; a smaller one from the same mountain is of a bright castaneous-red, with a rather vague infuscation on each elytron occupying about one-third of its surface. Seven from the Upper Williams River have the suture rather dark red, narrow and parallel on three of them, narrow at the apex and evenly dilated to

the base (but obscure) on two others, and near the base dilated into a subcircular spot on two others; on two others, from Bribie Island and Cairns, there is an almost circular spot on the suture towards the base. The length ranges 2·0–3·3 mm.

Queensland: Bribie Island, Cairns, Mount Tambourine; New South Wales: Dorrigo, Upper Williams River; North West Australia: Derby, Upper Ord River; North Australia: Darwin, Groote Eylandt, Melville Island; Papua: Mount Lamington.

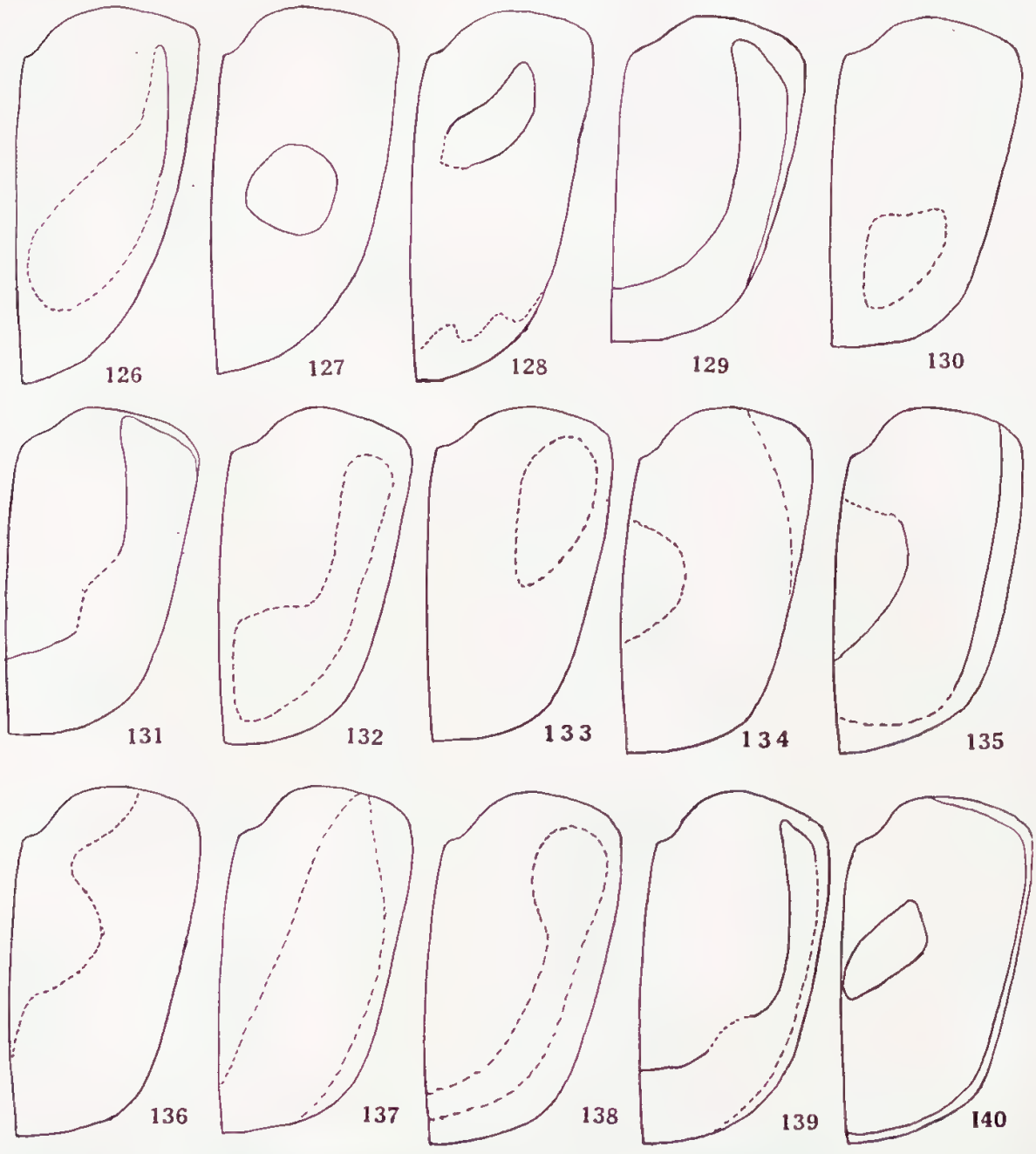

Fig. 126–140. *Parasemus obliquiniger* Lea. 127, *P. bimaculiflavus* Lea. 128, *P. quadrimaculatus* Lea. 129–133, *P. discoideus* Blackb. 134–139, *P. torridus* Blackb. 140, *P. doctus* Blackb.

Of four specimens from Mount Lamington that appear to belong to the species, two have a large space (truncated at the base, rounded elsewhere), occupying most of the median area of the elytra, of a rather dark red; one of them has the prothorax of the same colour, on the other it is dark, except at the sides; the third specimen has an obscurely reddish area not quite as large on the elytra; and the fourth has a somewhat oval, ill-defined, median area and the outer base obscurely reddish.

PARASEMUS DOCTUS Blackb.

Fig. 140.

There were no specimens of this species standing under the name in the Blackburn collection when it was acquired by the South Australian Museum; but one in my own collection, from Como, bears his name label as the species and agrees with the description. In general appearance the species bears a strong resemblance to *Litochrus plagiatus*, and some brightly marked ones of *L. maculatus*, but is distinctly wider. Several from Queensland, New South Wales, and Victoria agree well with the Como one; on three others from Queensland the prothorax is castaneous, and elytra mostly castaneous, with the markings in the same positions but much less contrasted.

Queensland: Cairns, Mount Tambourine; New South Wales: Blue Mountains, Como, Sydney; Victoria: Lakes Entrance.

NOTES ON THE SUPPOSED PRIMITIVE STONE IMPLEMENTS FROM THE TABLELAND REGIONS OF CENTRAL AUSTRALIA

By NORMAN B. TINDALE, Ethnologist, South Australian Museum.

Fig. 1-4.

In 1921 Howchin (1) described some flints from the plateau region of Central Australia, which he considered were humanly worked; he compared them with the handiwork of the primitive Tasmanians.

Renewed interest in the archaeological remains of man in Australia warrants a critical review being made of this record. Wood Jones and Campbell (2) have already brought forward much field evidence to show that these "plateau coliths" of the tableland region of northernmost South Australia and of Central Australia are of natural origin, and in view of their evidence it would appear almost unnecessary to consider further the validity of these objects. Further claims (Howchin (3)), however, have been made for them, and it is thought that a detailed study of the specimens themselves may throw additional light on the subject.

The criteria demonstrated by Reid Moir (4) and others, for the distinguishing of human artefacts, have been applied to the actual specimens (now in the South Australian Museum, Adelaide) upon which Howchin based the original observations.

The example marked in his paper (*l.c.*, p. 212, pl. xii, fig. 3), as "*5. Roughly-triangular and pointed rostro-carinate type,*" has been selected for detailed criticism as being one of the most striking and characteristic examples; its examination therefore may serve as a test of the validity of the assumption of the human origin of these objects. For purposes of comparison a typical Tasmanian implement of similar form has been subjected to a like examination.

Detailed studies of the directions of impact of flake-trimming blows, and their correlation with the resultant flake scars, show that in humanly-made flint implements the blows struck against the edge tend:

(1) To be delivered at a constant angle, which may be readily calculated by an examination of the resultant flake scars.

(2) The flakes removed are not usually squat, and are detached in such

a manner as not to leave a step or ledge at the point of their final separation from the implement (i.e., truncated scars are rare).

(3) Ripple marks are seldom numerous or of a prominent character.

(4) The secondary scars tend to be confined to one face, and produce a straight cutting edge. Such chipping may produce minute truncated scars, the ledges of which lie parallel to the margin of the implement.

(5) The greatest part of the work has been done at one time.

On the other hand, numerous experiments, and the study of flaked stones known to be of natural origin, has definitely shown that in them:

(1) The directions of the impacts separating the flakes tend to be fortuitous.

(2) The flakes removed are often squat, and are commonly stepped or have deep ripple scars.

(3) The secondarily flaked edge may bear scars indiscriminately placed on both faces of the stone; often producing an irregularly serrated edge.

(4) Varying degrees of weathering and patination indicate that the flakes have been removed at intervals over a period of time.

EXAMINATION OF TYPE EXAMPLE No. 5.

This example is described in detail in Howchin's original report; it is a triangular object superficially resembling the implements called "Kentian points" by Reid Moir. It is deeply patinated and stained with "desert varnish," the degree of reddening varying within wide limits on the various flake scars.

In general it may be stated that at least three generations of scars are apparent. These simulate the results of stages of flaking common to many stone implements, and may therefore be arbitrarily classified under the following three headings:

Trimming Flake Scars. These consist of a few large, rugose, partly etched, subconchoidally fractured and very deeply patinated surfaces, suggesting a typical "gibber" or "desert varnished" stone, with one flat flake face formed by a more recent fracture. There is nothing in these flake scars alone to differentiate this stone from any fractured "gibber." In the figures (fig. 1-2) these areas are diagrammatically marked and indicated by dotted shading.

Primary Flake Scars. Numbers of medium-sized but not regular fawn-coloured scar surfaces are present; these have smooth faces and rounded edges, usually with a well-marked, pale ferruginous patina.

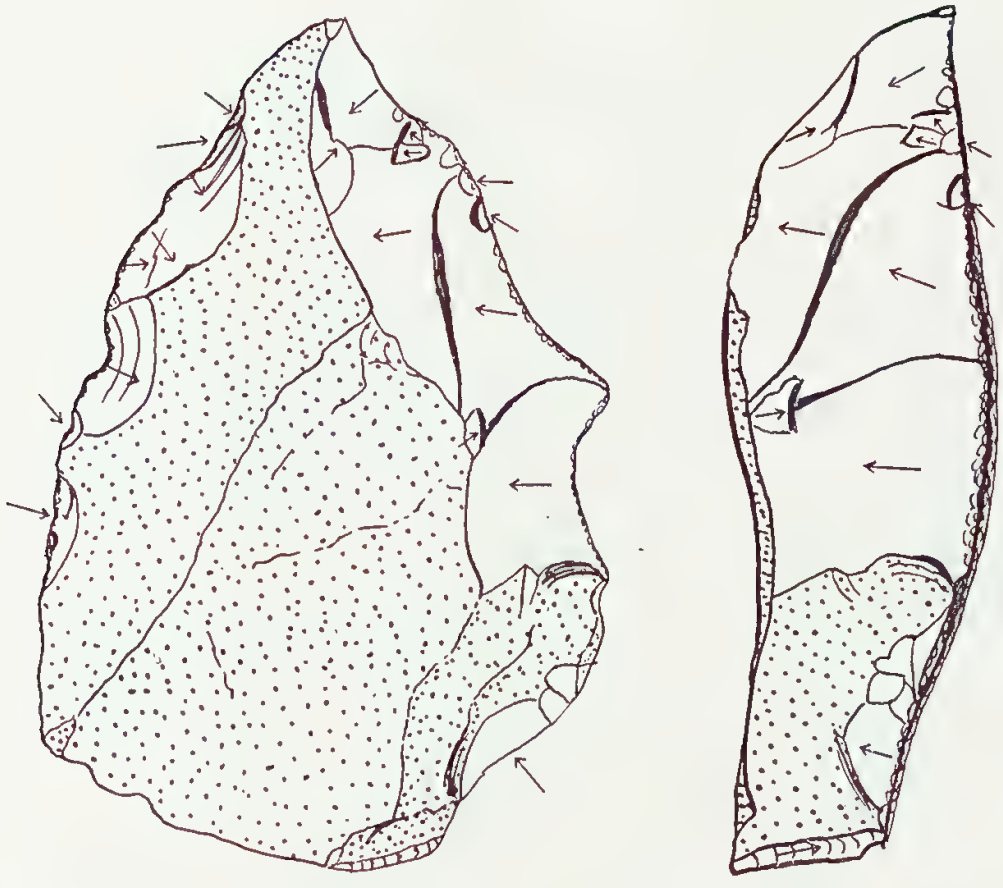

Fig. 1–2. Plateau colith.

Of the twenty "primary" flake scars examined the directions of six conform (within a range of 10° to the "normal" for humanly struck blows; eight deviate from this angle by between 20° and 45°, and the rest lay between 45° and 180°. The actual angles are approximately: 20°, 15°, 35°, 20°, 25°, 40°, 180°, 70°, 60°, 40°, 60°, 50°, 140°, and are indicated diagrammatically in the figure by arrows. Of the six "normal" scars three show deep stepping, due to "faults," in the direction of blow; one other shows prominent ripple marks; their distribution over the stone is a random one.

Secondary Flake Scars. Greyish-coloured and fresher-looking fracture faces, chiefly marginal, and usually of small size; the ferruginous staining is of various degrees, and ranges from "marked" to "absent."

Owing to the smallness of some scars, detailed numerical treatment is difficult. Of one hundred and seven well-marked scars sixty-three are on the trimmed side, forty-four on the flaked side. In normally worked flake implements the latter may represent fewer than 1 per cent. of those present, and are usually attributed to accidental injuries. The directions of impact of the secondary

blows are fortuitous, varying vertically through an angle of 220°, and horizontally through an angle of at least 45°. The degrees of weathering indicate that at least two, perhaps three, generations of scars are present (some of the third may, however, be due to accidental injuries sustained since the stone was discovered).

There is no evidence either in the primary or secondary flaking to support human intervention.

Further evidence of the natural origin of this and the other similar specimens is furnished by the following facts relating to their occurrence in the field:

(a) They may always be found by examining suitable "gibber" plains.
(b) They have never been found disassociated from the sources of supply (i.e., stony plains).
(c) By a discriminating examination of the stones on any such plain it is possible to select a small percentage of implement-like forms. In the course of several visits to Central Australia many examples of these have been noted.

These tend to differ from normal implements, in that:

(1) The flaking is of several generations.
(2) The degree of patination of the "trimming," "primary," and "secondary" flaking is markedly unequal.
(3) The scars suggest that the impacts (or other active agents) which removed the flakes acted with varying force, in many different directions, and at various (sometimes wide) intervals of time.

EXAMINATION OF A TASMANIAN IMPLEMENT.

A typical Tasmanian native stone implement (A. 14414, in the South Australian Museum) has been taken at random from the collection. It is of a dull-grey cherty flint, with a texture approximating to, but slightly coarser than, the material of Howchin's "eoliths."

This implement bears a natural striking platform, indicating that it has been struck off, as a moderately thin flake, from a large, rounded, waterworn pebble; traces of the original surface are indicated in the accompanying diagrams (fig. 3-4) by line shading. The flake surface bears traces of the bulb of percussion, and faint ripple marks are evident on its plane surface. The implement is rounded-triangular in shape, and has been trimmed so that there are two concave cutting margins and a straight back, the latter bearing part of the striking platform.

Trimming Flake Scars. A detailed consideration of these is unnecessary for the present purpose; they are indicated by dotted shading in the figures. The whole of the worked parts of the implement are uniformly preserved, and do not suggest flaking at intervals over a period of time.

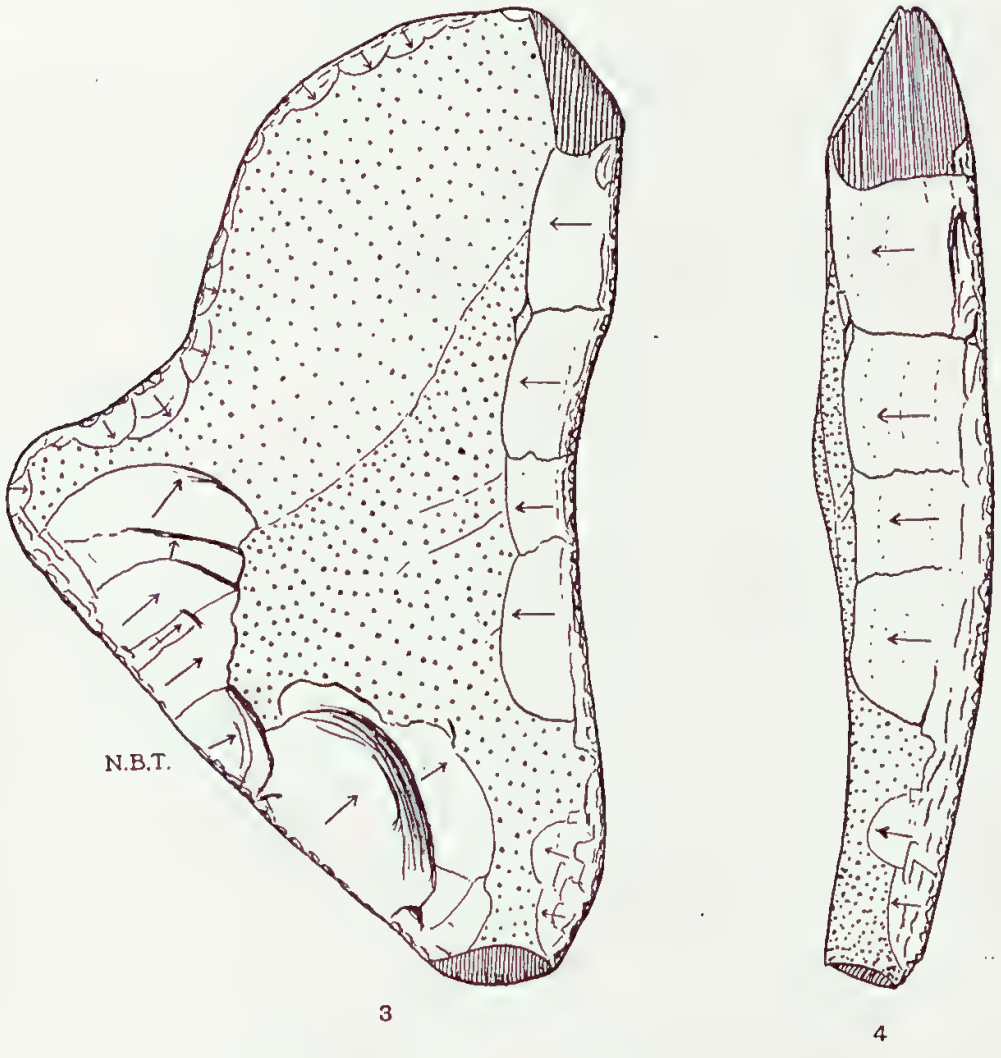

Fig. 3–4. Tasmanian stone implement.

Primary Flake Scars. There are fourteen scars on the working margins. The directions of impact are all "normal"; truncated primary scars are absent. On the margin of the striking platform there are eight scars; seven are "normal," and one deviates by some 35° from that angle. In contradistinction to the working edges all the scars on the edge of the striking platform are truncated; this seems to be an inevitable result of the obtuse angle of the margin.

Secondary Flake Scars. The accurate enumeration of the secondary scars is a matter of difficulty. At least one hundred and thirteen scars have been noted on the sides of the cutting edges, while the margin of the platform bears

some thirty-four. The angle of impact does not vary beyond the usual limits; regular series of minute truncated scars with their scar traces strictly parallel to the margin are noteworthy. Four scars only appear on the flake surface of the implement, and each of these appears to be of accidental origin.

Thus the Tasmanian implement, primitive though it appears to be, bears indisputable evidence of its human origin.

Howchin has made direct associations between Tasmanian implements and his "eoliths." It would seem that his comparisons are based on fallacious grounds and his claims not tenable. It is possible that eventually Tasmanoid implements will be recognized from mainland Australia; the last word has not yet been said with regard to some of the older sites in New South Wales, Victoria, and South Australia, but it seems highly desirable that any future claims should be based, not on generalized comparisons which may break down on critical analysis, but on detailed studies.

SUMMARY.

From an examination of the type examples of the so-called "plateau eoliths" of Central Australia, evidence has been deduced to show that they are probably not the handiwork of man, but that they bear evidence of a natural origin in the fortuitous nature of the flaking and the marked differences in weathering and patination of the various surfaces.

Thus the conclusions arrived at by Wood Jones and Campbell are strongly supported by considering the problem from quite a different viewpoint.

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1. Howchin, W.: Trans. Roy. Soc. S. Aust., 45, 1921, pp. 206-230, pl. xi-xxi.
2. Jones, F. Wood and Campbell, T. D.: Journ. Roy. Anthrop. Inst., 55, 1925, pp. 115-122, pl. xix-xx.
3. Howchin, W.: "Building of Australia," pt. 3, 1930, p. 669.
4. Moir, J. Reid: Pre-palaeolithic Man, Ipswich, 19 ??
5. Moir, J. Reid, *l.c.*, p. 46, pl. xix, fig. 4v.

The NEW ZEALAND SCAMPERDOWN WHALE *(MESOPLODON GRAYI)* in SOUTH AUSTRALIAN WATERS

By HERBERT M. HALE, Director, South Australian Museum.

Fig. 1-10.

Mesoplodon grayi Haast.

Mesoplodon grayi Haast, Proc. Zool. Soc., 1876, pp. 7 and 457; Waite, Rec. S. Aust. Mus., ii, 1922, p. 213, pl. iii, figs. 7-8; Oliver, Proc. Zool. Soc., 1922, p. 572 (syn.).

In May, 1931, Dr. A. M. Morgan and Mr. J. Sutton came across a small, decomposing whale which had been cast up on Younghusband Peninsula, near the mouth of the River Murray, South Australia; they removed the mandibular teeth and the right periotic, bringing these to the Museum for identification. Shortly afterwards, the writer, in company with Messrs. N. B. Tindale and H. Condon, visited the spot. By this time decay and the action of the waves had resulted in the scattering of a number of the bones, some being found half a mile from the carcase. Careful search, however, resulted in the recovery of all but the following: Fifth rib of left side, first and third segments of sternum, fourteenth and fifteenth caudal vertebrae, five of the chevrons, the pelvic bones, and all bones of the left flipper excepting the humerus.

The specimen was a young example of *Mesoplodon grayi,* a species recorded from southern Australia by Waite *(ut supra)* on the evidence of the left ramus of a mandible found on the beach at Kangaroo Island. The skeleton has been assembled by our taxidermists (Messrs. J. and A. Rau), and, as mounted, the total length is 299 cm.

Skull.

Not markedly asymmetrical and with none of the sutures anchylosed. Rostrum curved slightly downwards, with lateral groove well developed and deep. Premaxillae over-arching mesorostral gutter, the sharp dorsal edges only 5 mm. apart, and parallel to a point 20 mm. behind level of premaxillary foramina, where they incline very slightly to the left. Expanded distal portions of premaxillae smooth anteriorly, but rugose dorsally and slightly over-arching. The vomer appears in the mesorostral groove at 110 mm. from tip of rostrum and

Fig. 1. Skeleton of *Mesoplodon grayi*.

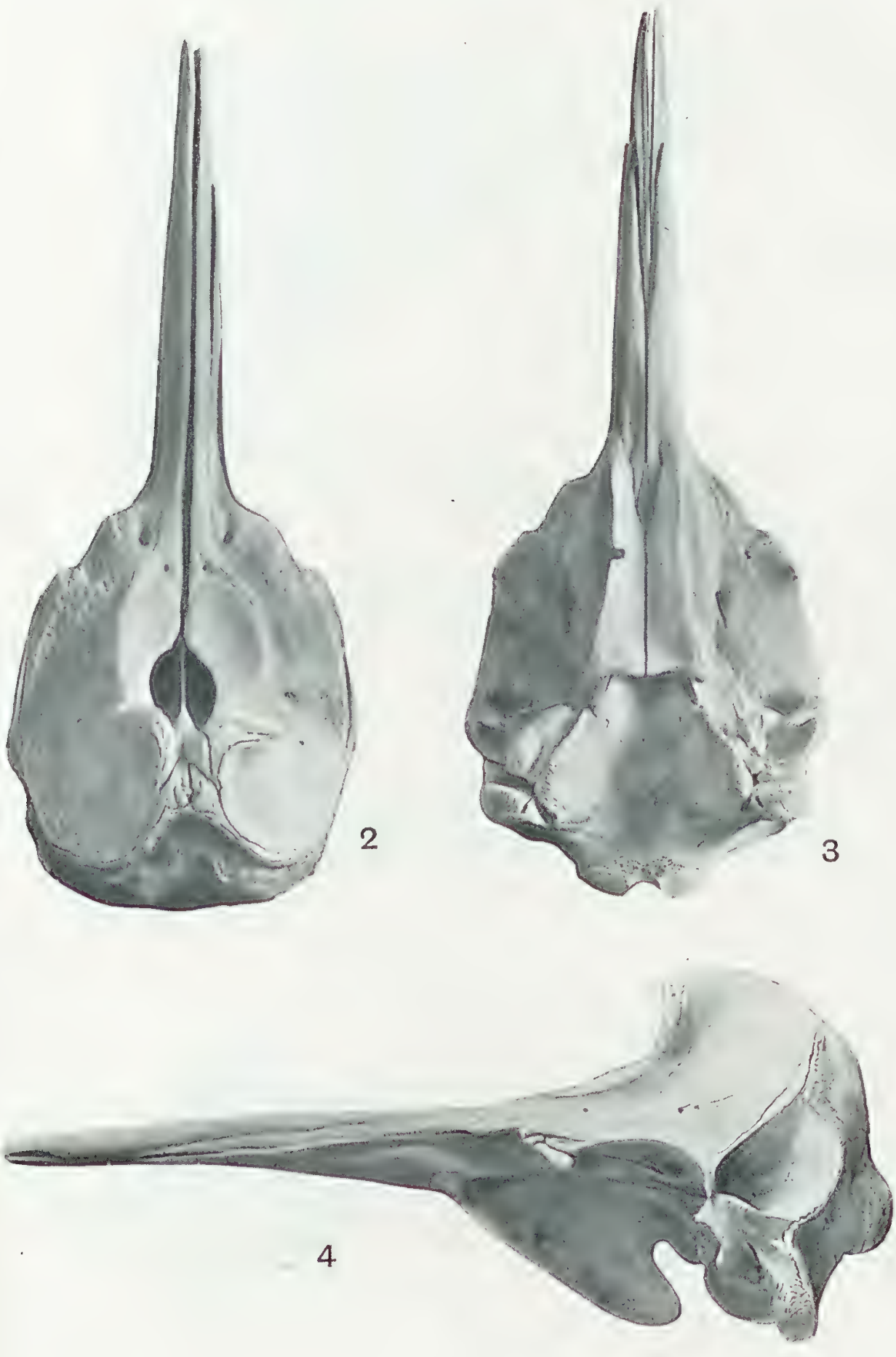


Fig. 2–4. Dorsal, ventral, and lateral views of skull of *Mesoplodon grayi*.

ventrally at this point also, its inferior visible portion fusiform and 100 mm. in length. The premaxillary foramina are in line, and are 11 mm. posterior to level of maxillary foramina.

Mandible and Teeth.

The tip of the mandible is bent a little to the left and the rami are separate. The mandibular teeth are hollow shells, excepting for extreme tip of denticle; the whole inner face of each is slightly concave, the outer convex, and the tip of the denticle for about 1 mm. of its length is vertical.

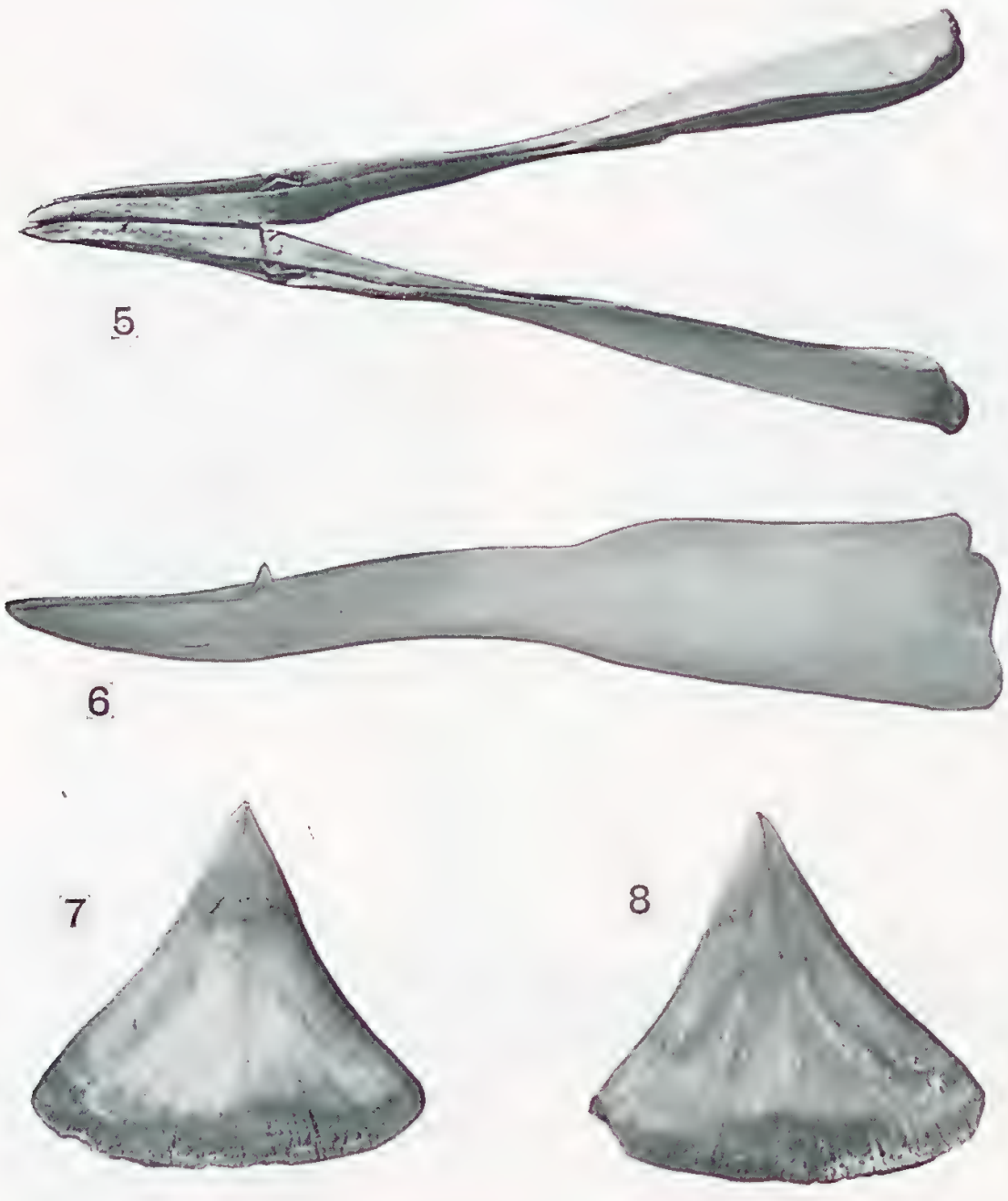


Fig. 5–8. *Mesoplodon grayi;* 5–6, mandible; 7–8, left and right mandibular teeth.

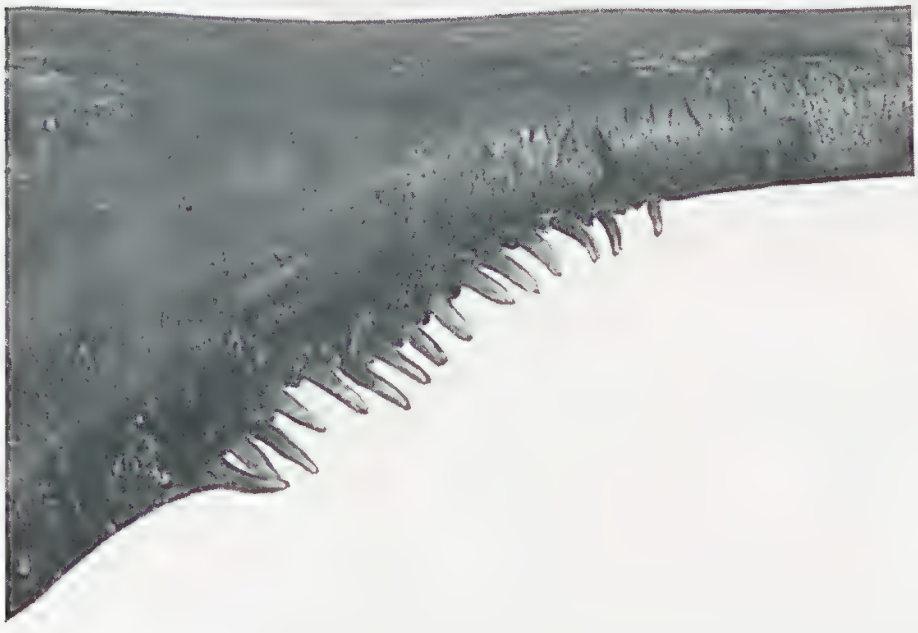


Fig. 9. Small teeth in upper jaw of *Mesoplodon grayi*.

Portion of the skin of the rostrum was recovered; this exhibits fifteen small conical teeth on the right side of the upper jaw (the left portion decayed).

The dimensions of the mandibular teeth are:

	Left.	Right.
Length of base	40 mm.	40 mm.
Greatest depth	36 mm.	37 mm.
Greatest width	9 mm.	10 mm.

Dimensions of Skull.

	mm.
Total length	560
Height from vertex to inferior border of pterygoids	210
Tip of rostrum to level of antorbital notches	340
Tip of rostrum to posterior border of pterygoids	440
Greatest depth of rostrum	51
Breadth between orbits	220
Breadth between antorbital "tubercles"	153
Breadth of premaxillae in front of nares	96
Greatest breadth of anterior nares	40
Lengths of tympanic bullae	48–51
Breadths of tympanic bullae	31–35
Vertical height of supraoccipital (dorsal edge of foramen magnum to top of occipital crest)	100

Width of foramen magnum	40
Width of condyles	81
Height of condyles	53
Length of rami of mandible	490
Greatest depth of mandible	90
Length of symphysis	130

Vertebrae, Ribs, etc.

The number of vertebrae is: Cervical, 7; thoracic, 9; lumbar, 11; caudal, 20 (including the two which are missing, but which have been modelled and installed in place) = total 47.

Cervicals. The first two are fused, the remainder wholly free; there is a foramen on each side between neural arches of first and second. Foramina above anterior articular facets complete. Inferior lateral processes of first short, stout, and blunt, that of second longer and directed backwards. Superior lateral process of second rather slender and directed backwards. Superior lateral processes of succeeding cervicals irregular; inferior processes of third and fourth slender, of fifth and sixth considerably stouter. Neural spine of sixth a little higher, but much more slender, than that of first and second; that of third to fifth scarcely apparent; there is a gap dorsally in the neural arch of the fourth. The seventh has the spine vertical and much longer, as long as the height of the arch, and bears an elongate facet for the head of the first rib.

Thoracics. Neural spine of first sloping slightly back, slender, and about as long as arch and centrum together; to the fourth the spines increase successively in length and width; in the remainder they are subequal in size. Process with facet for tubercle of first rib wide and thick, directed a little forwards and downwards. Facet for head of second rib prominent, near posterior margin of side of centrum. Articular facets on second, third, and fourth thoracics similar, but processes with articular facets for tubercles of ribs stouter. Facets for head of sixth rib on a short process near top of side, and near the posterior margin, of sixth. Lateral processes of seventh to ninth successively increasing in width, each with facet. Centra of sixth to ninth with an inferior keel, blunt on the sixth, sharp on the others.

Lumbars. Neural spines truncate, subequal in width, successively increasing in height to the tenth, the eleventh shorter. Transverse processes narrowest in anterior lumbars, and becoming shorter and wider in posterior lumbars. Each centrum with a sharp median keel inferiorly. Metapophyses successively becoming closer together.

Caudals. First (28th vertebra) similar to last lumbar, but centrum with a pair of low longitudinal keels inferiorly, each highest posteriorly where the articular facets for the first chevron bones are situated. Second with similar keels and posterior facets for second chevrons, and also with slightly elevated anterior facets for the first chevrons. In succeeding lumbars the anterior and posterior elevated portions of the keels, with their articular facets, become successively closer together, joining on each side on the eighth to tenth, but leaving a foramen between. The centra of the third to eighth have a low ridge on each side above the transverse process, nearer to the latter in the third, but nearer to the neural arch in the others; this ridge is scarcely distinguishable on the eighth. The neural arch disappears after the eleventh, on which it is represented by a perforated knob.

Chevrons. Apparently were ten in number, in which case the second, third, sixth, ninth, and tenth are missing. The members of the first pair are not united.

Ribs. The first of the nine pairs of ribs is shorter and wider than any of the others. The first five are double-headed, and the head of the sixth has two articular facets. The last rib is relatively large.

Sternum. First and third segments missing, but modelled for skeleton. Second segment rectangular, with anterior notch much deeper than posterior. Fourth and fifth segments fused together, with a small foramen between; anterior notch of fourth shallow, and posterior segment irregular in shape.

Scapula and Fore-limb.

Anterior and posterior margins of scapula nearly straight, slightly sinuate. Ridges distinct. Acromion bent a little inwards, with edges subparallel. Coracoid somewhat shorter and rather slender.

Fig. 10. Scapula and fore-limb of *Mesoplodon grayi.*

The complete right limb was recovered. The humerus has the head only slightly oblique, and the radius is scarcely widened at either end. The ulna is two-thirds as wide as the radius, with the oleocranon thick and prominent.

There are six carpals, two on ulna side, in line with metacarpal iv, and four on the radial side, the middle two above metacarpals ii and iii. Phalanges, including metacarpals: i, 1; ii, 5; iii, 5; iv, 4; v, 3.

Loc. Younghusband Peninsula, Ninety Mile Beach, South Australia. (Skeleton and portion of skin of jaw in South Australian Museum, Reg. No. M. 3003.)

REVISION OF THE AUSTRALIAN GHOST MOTHS (LEPIDOPTERA HOMONEURA, FAMILY HEPIALIDAE)

PART I.

By NORMAN B. TINDALE, South Australian Museum.

Fig. 1-64.

INTRODUCTION.

This paper is the first of a series, in which it is hoped to review the Australian genera and species of the family Hepialidae, or Ghost Moths.

This group includes some of the most archaic of lepidopterous insects, veritable living fossils, which have survived in greater profusion in the isolated continent of Australia than in any other part of the world.

Their injurious feeding habits in the larval state cause many of them to be of considerable economic importance to the timber and grazing industries.

The present review is based on practically all the material of the family preserved in the various Museums and private collections of Australia. In 1929, through the co-operation of the Australian National Research Council and the Board of Governors of the South Australian Museum, most of the larger collections in Victoria and New South Wales were examined, and many specimens were brought back to Adelaide for detailed study. Special thanks for the loan of material and other data are extended to the Directors of the Australian, MacLeay, and National Museums, to Drs. A. J. Turner and G. A. Waterhouse, and to Messrs. W. B. Barnard (Toowoomba), G. M. Goldfinch (Sydney), C. G. L. Gooding (Moe), J. A. Kershaw (Melbourne), G. Lyell (Gisborne), and L. J. Newman (Perth).

A bibliography, a key to the genera, some notes on general ecological problems, and a further list of acknowledgments will be given at the conclusion of the review of genera and species.

Family HEPIALIDAE.

This is one of the largest surviving groups of the Homoneura, which are characterized by the marked similarity in the venation of fore- and hind-wings.

All the members of the family possess a lobe, called the jugum, at the base of the posterior margin of the forewing, for which reason they are sometimes grouped together with some other primitive forms under the term Jugatae.

The Hepialid type is of great antiquity, dating back at least to the Jurassic Period. Characters believed to be primitive are the marked gap between the fore-and hind-wings, the homoneurous venation, the obsolete mouth-parts, and the scale-like hairs, which appear to give an indication of the mode of origin of the more complex scales of the specialized Lepidoptera.

The eggs are small and produced in incredible numbers; the larvae are long and naked, with sparse hairs, often set upon warts; they live underground, feeding on roots, or as borers, in trees. A few species live in underground tunnels, but emerge on the surface at night to feed on grasses. The pupae are elongated, with the appendages free; they are capable of motion within the pupation tunnel by means of serrated margins to some of the mobile segments of the abdomen. The adults are incapable of feeding, being without functional mouth-parts, and therefore have but a brief existence.

The researches of Philpott upon the structure and relationships of the primitive Lepidoptera have done much to clarify our knowledge of the form and classification of this family; his original papers should be consulted for discussions on the detailed structure.

Short descriptions of form and markings, unaccompanied by illustrations, have proved to be of doubtful value in the study of the Hepialidae, partly owing to the underlying sameness of wing pattern throughout the group, and partly owing to the great variability which may exist within the limits of a single species. In this revision considerable reliance is placed on illustrations, the colour descriptions being usually based on the actual examples figured. In each case the total number of specimens examined is given at the end of the locality lists.

Owing to the brief emergence periods of some species, it has been considered advisable on occasion to quote the detailed dates of capture of the specimens under review; in all other cases the months of emergence are indicated, where known, by the numbers (1 to 12) which follow the locality name.

The types of the species described by Scott were found to be in the Australian Museum collection, and had been identified and labelled. The Lucas and Lower type specimens, together with a few of Turner's species, are in the South Australian Museum collection. Through the courtesy of the authorities of the British, Oxford University, and Tring Museums, photographs of the Walker, Swinhoe, and Felder type examples have been received. Definite determinations have been made possible for many species hitherto only doubtfully recognized,

and the synonymy, often clouded by false identifications, has been made somewhat less obscure.

Kirby (1892) was the first to fix the genotypes of the genera erected by Herrich-Schaeffer, Walker, and other early workers in this family. Some of his nominations are not in accordance with the International Rules of Zoological Nomenclature, and cannot stand. Each case has been discussed in detail in the following pages.

In 1914 several plates figuring Australian Hepialidae were published in Seitz' Macrolepidoptera, without descriptive text. Up to the present time this lack has not been supplied, owing to the death, during the Great War, of the author, the late R. Pfitzner. Through the courtesy of Professor A. Seitz a copy of Pfitzner's manuscript list of the "Hepialidae of the Indo-Australian Fauna" has been received; in this the missing localities and generic indications are given.

Pfitzner's illustrations represent definite "indications" (International Rules, Article 25), and are therefore valid. In the synonymy quoted in this paper his name and that of the genus are placed within square brackets to show that they are not definitely indicated in the original publication and have been supplied from the manuscript.

TRICTENA Meyrick.

Trictena Meyrick, Proc. Linn. Soc. N.S. Wales, iv. (2), 1889, p. 1135.

Antennae tripectinate in both sexes (fig. 2-3). Labial palpi well developed,

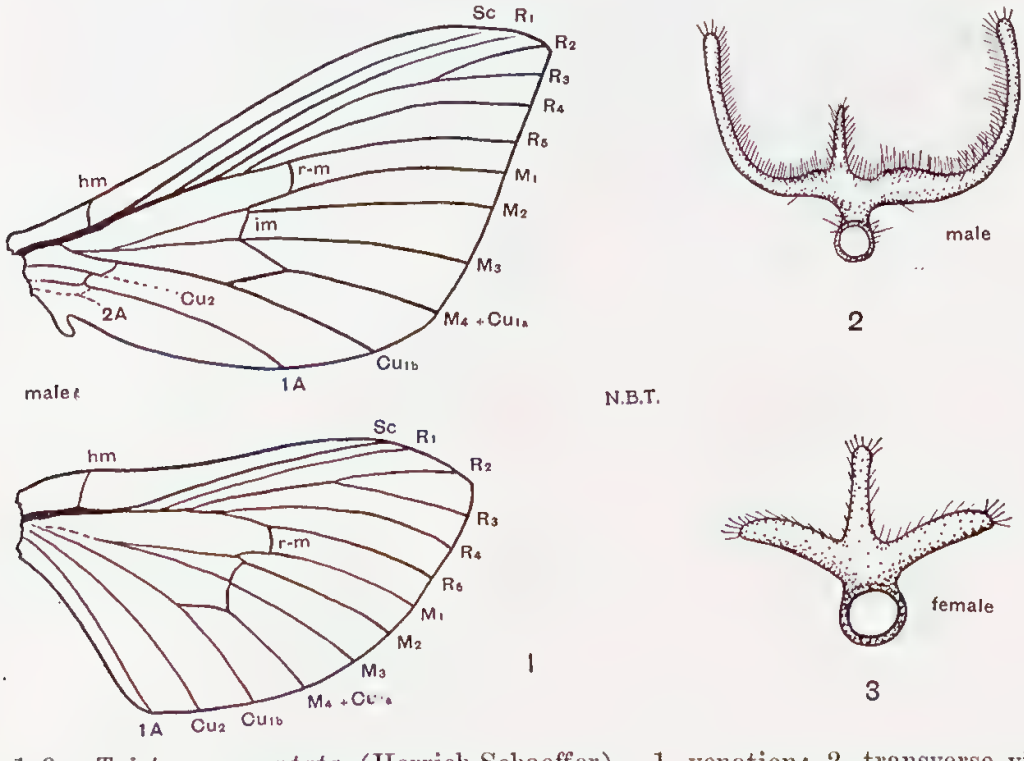


Fig. 1–3. *Trictena argentata* (Herrich-Schaeffer). 1. venation; 2. transverse view of a male antennal segment; 3. *ditto* female.

three segmented; second segment longer than first, apical segment half the length of second, and twice as long as wide. Maxillary palpi reduced, composed of a single spherical segment. Forewings with R_1 separating from R_3 before branching of R_5; R_4 and R_5 forked. Hindwings with R_4 and R_5 branching before radio-median cross-vein (fig. 1). Genotype: *Trictena argentata* (Herrich-Schaeffer, 1855) = (*labyrinthica* Meyrick, 1889, *nec* Donovan, 1805).

Members of this genus can be distinguished from all other genera of Australian Hepialidae by the tripectinate antennae.

KEY TO THE SPECIES OF TRICTENA.

a. Forewings with subterminal white band broad, often broken up into a series of isolated spots or abbreviated .. .. *argentata*
aa. Forewings with subterminal white band narrow, seldom abbreviated or broken up into a series of isolated spots .. *argyrosticha*

TRICTENA ARGENTATA (Herrich-Schaeffer).

Fig. 1-10.

Cossus labyrinthicus Angas, South Australia Illustr., 1847, pl. 37, fig. 12, male (*nec* Donovan).

Epiolus argenteus Herrich-Schaeffer, Lep. Exot., 1853, pl. xi, fig. 47-48, male and female (*nec* Donovan).

Abantiades argentatus Herrich-Schaeffer, *l.c.*, 1855, p. 5.

Pielus atripalpis Walker, List. Lep. Ins. Brit. Mus., vii, 1856, p. 1577.

Trictena labyrinthica Meyrick, Proc. Linn. Soc. N.S. Wales, iv (2), 1889, p. 1135 (*nec* Donovan).

Pielus hydrographus Swinhoe, East. Lep. Het., i, 1892, p. 289 (*nec* Felder).

Trictena labyrinthica [Pfitzner], Seitz Macrolep., fauna indo-australica, ii, 1914, pl. 75a, male and female.

♂ Antennae dark brown, palpi pale brown, thorax abdomen and legs greyish-brown. Forewings dark greyish-brown with numerous labyrinthine markings; irregular silvery-white discoidal and terminal white bands; a series of anal marginal spots may be present (fig. 4), vestigial (fig. 8), or absent. Hindwings greyish-brown. Expanse, 105 mm.

♀ Antennae and palpi brown, abdomen densely clothed with pale fawn-coloured down. Forewings greyish-brown with lighter labyrinthine markings; distinct traces of discoidal and terminal white bars present, much infuscated. Hindwings greyish-brown. Expanse, 166 mm.

Loc. Queensland: Toowoomba 6. New South Wales: Sydney 5; Roseville 9; Mittagong 4; Hornsby 6; Newcastle; Ash Island; Clarence River; Narromine;

Fig. 4. *Trictena argentata* (Herrich-Schaeffer), male, Blackwood, S.A., nat. size.

Fig. 5. *Trictena argentata* (Herrich-Schaeffer), female, Blackwood, S.A., nat. size.

Bowral; Tuncurry 6; Glen Innes 5; Beecroft. Victoria: Gisborne 4; Macedon 4; Caulfield 4; Castlemaine 4; Fig Tree Gully 5; Moe; Kilmore 4; Bullengarook 4; Timberoo South 5. Tasmania: Hobart. South Australia: Adelaide 4, 5; Waikerie 5; Ardrossan 5; Moonta 5; Bungaree 5; Blackwood 4, 5; Cooper Creek; Tarcoola 5; Port Augusta 5; N.W. of South Australia. Western Australia: Perth 7; Swan River; Boulder; Fraser Range 10. 84 males, 28 females.

The pair described and figured (fig. 4-5) are from Blackwood (I. 18653 in South Australian Museum). The species is wide-ranging and variable. Two principal forms may be distinguished.

a. Forewings with labyrinthine markings well developed .. *argentata*
aa. Forewings with labyrinthine markings obsolete or absent f. *atripalpis*

The plain dark examples (fig. 8) are usually larger than the others, and seem to be characteristic of cold, wet districts. In the more northern localities and under arid conditions the specimens are smaller, paler in colour, and are well marked. Both forms may occur in the same locality; they are therefore not strictly geographical races. The variation is possibly climatic and seasonal, for

Fig. 6. *Trictena argentata* (Herrich-Schaeffer), male aberration with pattern on hindwing.

in the vicinity of Adelaide, where both forms are taken in abundance, the larger and darker examples appear to be most abundant after wet winters. Fig. 6 shows an aberration in which the pattern of the forewing is partially represented in the hindwing.

Seven males and four females of this species are present in the MacLeay Museum. According to Scott (1) these include a pair, unmarked, which are the types of "*labyrinthicus* Donovan." Careful comparison shows that none of specimens agree, even superficially, with Donovan's original figures. On the other hand, there is a female, with unipectinate antennae, which may be Dono-

(1) Scott, A. W., Aust. Lep. ii, 1864, p. 12.

van's type of *Abantiades argenteus* = *labyrinthicus*. This example is described in the appropriate place.

Fig. 7. *Trictena argentata* (Herrich-Schaeffer), male, Adelaide, G. F. Angas (Oxford University Museum).

Professor E. B. Poulton has kindly examined the example, collected at Adelaide by G. F. Angas, which was described by Swinhoe, erroneously, as the male of *Abantiades hydrographus* (Felder). It has tripectinate antennae, and, as the photograph (fig. 7) shows, is an example of the present species.

Fig. 8. *Trictena argentata* f. *atripalpis* (Walker). Type, a male, Tasmania (British Museum).

The type of *f. atripalpis* (Walker), preserved in the British Museum, is also depicted (fig. 8). It was probably caught at Hobart, where Morton Allport did much of his collecting. This place may be therefore regarded as the typical locality for the plain dark form of the species.

The moth is abundant both in wet and dry localities. In many parts of arid Australia, south of Latitude 24, it is associated with the red-gum *(Eucalyptus rostrata)*, upon the roots of which the larvae appear to feed. These trees grow on the banks of dry river beds, wherever there is abundant subterranean moisture.

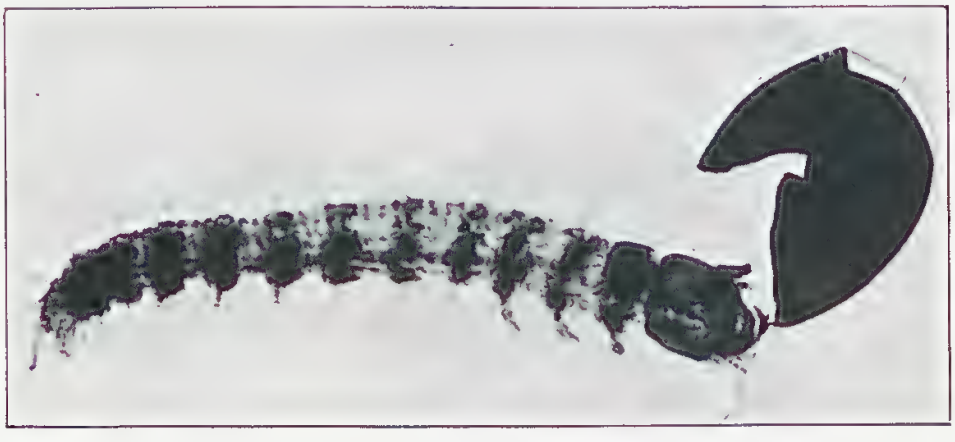


Fig. 9. *Trictena argentata* (Herrich-Schaeffer). Newly emerged larva × 25.

Egg. A female captured at Adelaide laid 29,100 eggs, and upon dissection an additional 15,000 fully-developed ones were secured. The moths lay their eggs while flying, broadcasting them in the vicinity of the gumtrees. When first laid the eggs are pale creamy-yellow, darkening to a slate-grey colour soon after deposition. In form they are almost spherical, smooth, and 0·6 mm. in diameter.

Larva. Eggs kept in a dark, damp place hatched within 24 days. The newly-emerged larva (fig. 9) is approximately 3·5 mm. in length, with large,

Fig. 10. *Trictena argentata* (Herrich-Schaeffer). Adult larva, nat. size.

ochreous head, prominent jaws, and white, cylindrical body, naked, with a few sparse hairs. Sixteen legs are present. There is a full-grown larva in the South Australian Museum, labelled as belonging to this species; it is creamy-

white in colour, with dark castaneous-brown thoracic chitinizations (fig. 10). The head and the apex of the abdomen are ochreous. Length, 112 mm.; diameter, 14 mm.

Pupa. The cast skins can be readily distinguished from those of the pupae of the species of *Abantiades* by the impress of the tripectinate antennae on the facial mask. Pupation takes place in a vertical cylindrical tunnel 45 cm. deep, which approaches to within a few millimetres of the surface. Nothing is known concerning the duration of larval or pupal life.

In southern districts the imago emerges in the late afternoon after the first autumn rains have fallen. In the arid northern areas the moth emerges at irregular seasons, either shortly after or during the progress of heavy rainstorms. They are attracted to lights and to fires. Angas (2) records that on the banks of the Lower Murray River these "large ghost moths fluttered into the embers in such quantities that the natives made a capital supper on their scorched and roasted bodies." Similar incidents have been experienced among the natives of Cooper Creek (F. Wood Jones) and of the Northern Flinders Range (Tindale).

Gray (3) records that the natives of the Wirra tribe at Orroroo dug up the grubs and pupae from about the big gumtrees on the Pekina Creek, and cooked them in the ashes. They were known as *barti*.

TRICTENA ARGYROSTICHA Turner.

Fig. 11.

Trictena argyrosticha Turner, Trans. Roy. Soc. S. Aust., liii, 1929, p. 307, male.

♂ Antennae ochreous. Head, thorax, abdomen, and legs pale brown. Forewings brown, costa narrowly pale brown, inner margin broadly pale brown, with numerous fine scroll-like paler lines; irregular discoidal longitudinal and subterminal oblique silvery-white fasciae, partly margined with dark brown. Hindwings pale brown. Expanse, 110 mm.

♀ Unknown.

Loc. Queensland: Toowoomba 4; Atherton 3. New South Wales: Clarence River, 13 males.

The example described is a male from the type series (Toowoomba, April 8, 1924, I. 18654, in S. Aust. Mus.); the figure is from an almost identical example in the Lyell collection.

(2) Angas, G. F., Savage Life and Scenes in Australia, v. 1, 1847, p. 57.

(3) Gray, J., South Aust. Naturalist, xii, 1930, p. 6.

Fig. 11. *Trictena argyrosticha* Turner, male, Toowoomba.

Two specimens from Atherton have the central area of the forewings somewhat paler than in southern examples; the markings differ but little.

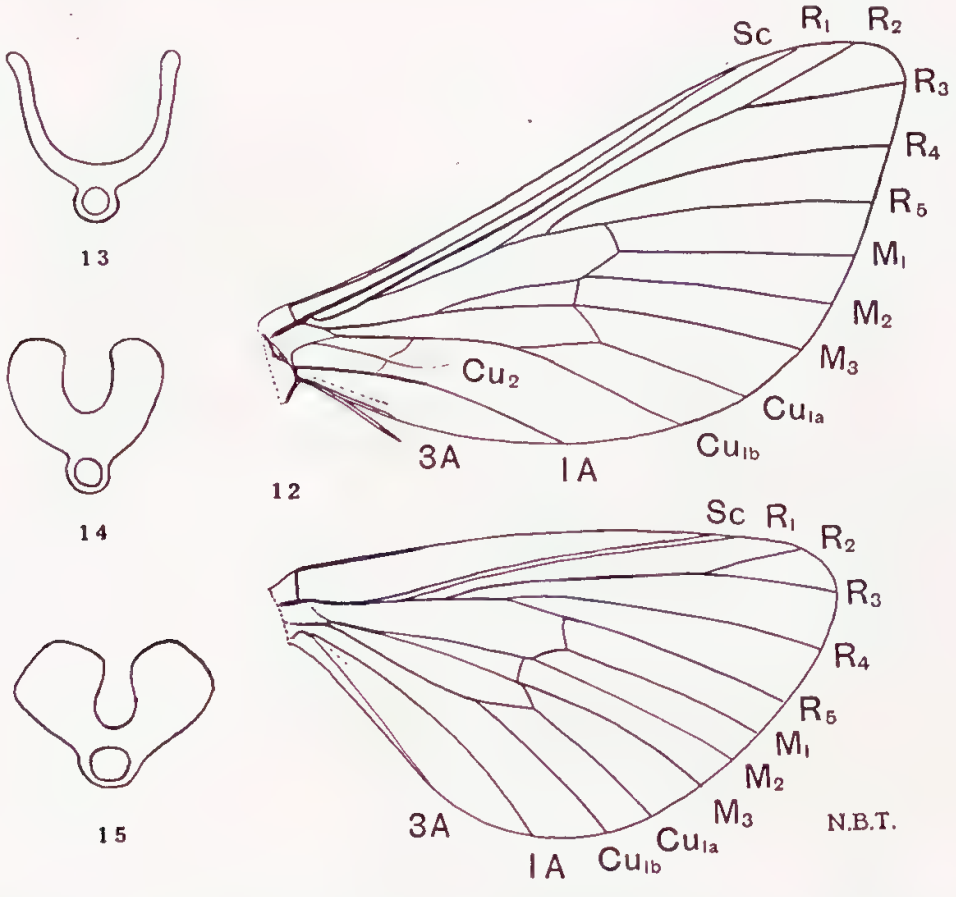


Fig. 12–15. 12. *Bordaia pica* gen. et sp. nov. Venation. 13. *ditto* transverse view of a male antennal segment. 14. *B. moesta* sp. nov. male antennal segment. 15. *B. furva* sp. nov. male antennal segment.

BORDAIA gen. nov.

Antennae bipectinate; palpi moderate, apparently three segmented, terminal segment reduced, base concealed by dense hairs. Forewings with R_1 separating from R_8 before branching of R_5; R_4 and R_5 forked. Hindwings with R_4 and R_5 branching before radio-median cross vein; cubito-median Y-vein absent (fig. 12).

Genotype, *B. pica* sp. nov.

The members of this genus combine the general appearance of some species of *Oxycanus* with the venational characters of *Abantiades* and its allies.

KEY TO THE SPECIES OF BORDAIA.

a. Forewings with conspicuous silvery-white bands.
  b. Pectinations of antennae (in sectional view) slender .. *pica*
  bb. Pectinations of antennae broad .. .. *moesta*
aa. Forewings without silvery-white bands.
  c. Forewings with obscure markings .. .. .. *furva*
  cc. Forewings without markings .. .. *paradoxa*

BORDAIA PICA sp. nov.

Fig. 12-13, 16.

♂ Head with face and palpi black; vertex greyish-brown. Antennae long, pectinations long and slender, minutely ciliated. Thorax greyish-brown, with long whitish hairs posteriorly. Forewings sub-hyaline, greyish-black with

Fig. 16. *Bordaia pica* sp. nov., male, 1·2 nat. size.

silvery-white markings, consisting of irregular discoidal longitudinal and oblique subterminal bands; a series of six white spots in apical third running parallel to subterminal band and a terminal series of six narrow marks between the veins. Hindwings sub-hyaline, greyish-white, the terminal third darker. Expanse, 52 mm.

Loc. South Australia: Cape Borda, on Kangaroo Island (February, 1905, J. Kopp; type I. 18655 in S. Aust. Mus.). Western Australia: Merredin. "Australia" (Lucas Coll.). 5 males.

The type example was attracted to light at the Cape Borda Lighthouse. The two unlocalized examples from the Lucas Collection are possibly Victorian. They agree closely with the type.

BORDAIA MOESTA sp. nov.

Fig. 14, 17.

♂ Head brownish-black; antennae fuscous. Thorax and abdomen brown above (except at base); brownish-black beneath. Forewings dark brown; three series of silvery-white markings; a broken irregular series from base meeting an

Fig. 17. *Bordaia moesta* sp. nov., Type, a male, Merredin.

oblique series from near apex; subcostal curved series in apical third, and a subterminal series near anal angle. Hindwings dark brown, base of wings and abdomen clothed with dense brownish-white pubescence. Expanse, 62 mm.

Loc. Western Australia: Merredin (L. J. Newman). 1 male.

In general appearance and build *B. moesta* resembles species of *Oxycanus*, from which it differs in important structural details.

BORDAIA FURVA sp. nov.

Fig. 15, 18.

♂ Head brownish-black; antennae with broad, flat lamellations, dark brown. Thorax brown, abdomen pale brown, with a tuft of paler hairs at base; beneath dark grey-brown. Forewings brownish-black, darker at base, with

numerous obscure scroll-like markings; a broad subterminal oblique black band from near apex to about vein Cu_1b enclosing two small rectangular white marks on R_4, and traces of others on R_3 and R_5. Hindwings greyish-brown. Expanse, 120 mm.

Fig. 18. *Bordaia furva* sp. nov. Type, a male, Western Australia.

Loc. Western Australia. (Type, unique, I. 18656, in S. Aust. Mus.).

A striking, if dully-marked form. The silver subterminal band characteristic of many Hepialidae is replaced by one of dull black. The antennae are long and stout, the lamellations being broad and angular.

BORDAIA PARADOXA sp. nov.

Fig. 19.

♂ Head uniformly reddish-brown; antennae with rather slender pectinations, dull ochreous. Thorax and legs reddish-brown, abdomen paler and densely covered with pink down, beneath pink, with reddish-brown apex. Forewings uniformly reddish-brown without markings. Hindwings a paler reddish-brown, at base densely clothed with pink-tinged creamy-white down. Expanse, 107 mm.

Loc. Western Australia: Lake Grace (April, 1930, W. B. Barnard). 1 male.

At first glance this insect could be mistaken for an unmarked example of *Abantiades hyalinatus* (Herrich-Schaeffer, 1853), but the broader wings, different venation, and above all the bipectinate antennae, are distinctive. The resemblance between the members of the present genus and some of the others seem to be rather the result of convergent evolution than of affinity.

ABANTIADES Herrich-Schaeffer.

Abantiades Herrich-Schaeffer, Lep. Exot., i, 1855, p. 5.

Pielus Walker, List. Lep. Ins. Brit. Mus., vii, 1856, p. 1576 (genotype *labyrinthicus* Donovan (*nec* Meyrick *et alia*), designated by Kirby, 1892).

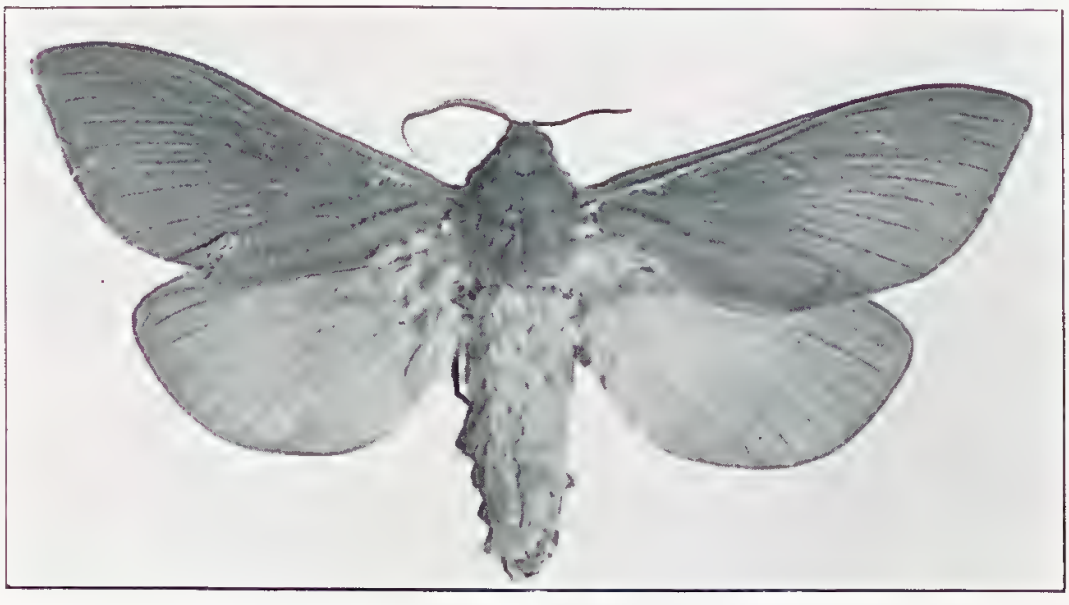


Fig. 19. *Bordaia paradoxa* sp. nov. Type, a male, Lake Grace.

Antennae unipectinate, pectinations often broad and lamellate in males, reduced in females. Labial palpi three-segmented, first and second segments approximately equal, apical one short, about as long as wide and subspherical; maxillary palpi reduced, forming ill-articulated protuberances at base of labium.

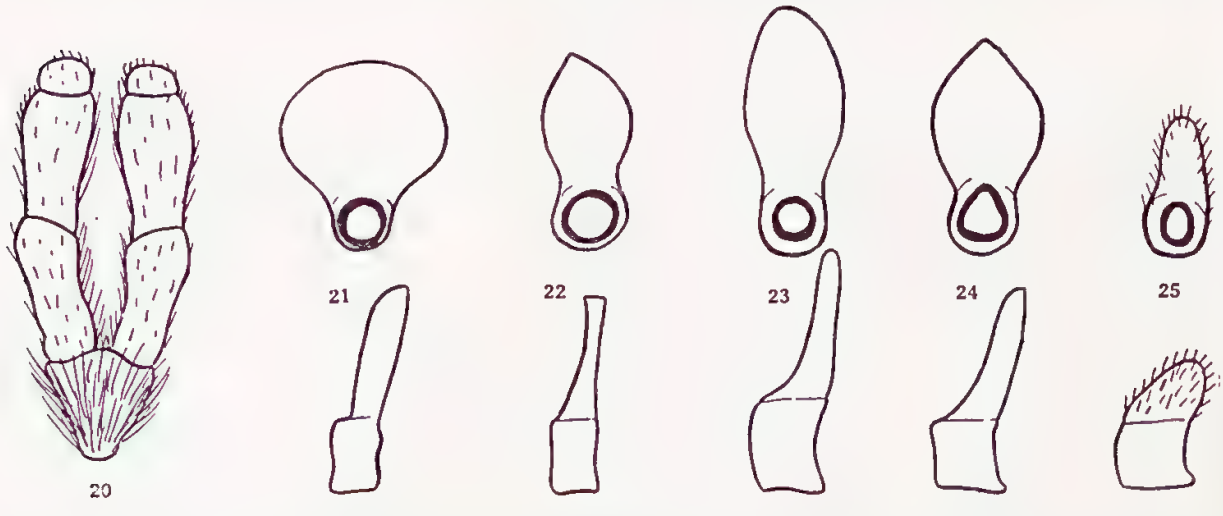


Fig. 20–25. 20. *Abantiades hydrographus* (Felder) palpi. 21. *A. leucochiton* (Pfitzner) transverse view of male antennal segment. 22. *A. barcas* (Pfitzner), male antennal segment. 23. *A. hydrographus* (Herrich-Schaeffer), male antennal segment. 24. *A. hyalinatus* (Herrich-Schaeffer), male antennal segment. 25. *A. aphenges* (Turner), male antennal segment.

Forewings with R_1 separating from R_S before branching of R_5; R_4 and R_5 forked. Hindwings with R_4 and R_5 branching before radio-median cross-vein.

Genotype: *A. hyalinatus* Herrich-Schaeffer, 1853 (*A. diaphanus* Herrich-Schaeffer, 1855), designated by Kirby, 1892.

Meyrick recognized only two species in this genus; fourteen are now known. Preparations of the mouth-parts, genitalia, and antennae of most of the species have been examined; the specific characters prove to be quite well marked, and the separation of the species is easier than in *Oncopera* and *Oxycanus*.

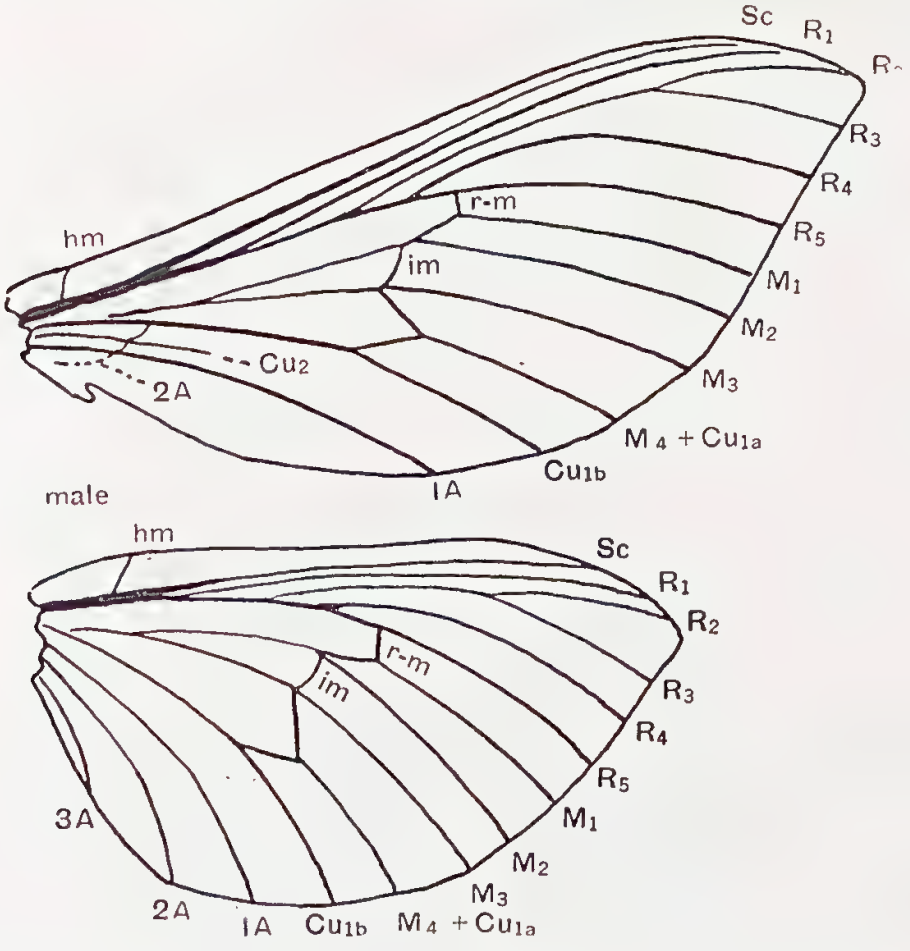


Fig. 26. *Abantiades hyalinatus* (Herrich-Schaeffer). Venation, male.

The generic and specific synonymy of *Abantiades* is involved, partly owing to the long-continued misidentification of the first described form, *A. labyrinthicus* (Donovan, 1805). The true *A. labyrinthicus* had unipectinate antennae, as is plainly shown in the original figures, which represent the sexes of a common New South Wales species with a broad black area surrounding the discoidal silvery fascia.

The name *Abantiades* was published by Herrich-Schaeffer (1855), with bibliographical references to his figures of three species published in 1853 (an

adequate indication according to Opinion 1 in the International Rules of Zoological Nomenclature).

No genotype was fixed until 1892, when Kirby designated *A. hyalinatus* Herrich-Schaeffer, 1853 (*diaphanus* Herrich-Schaeffer, 1855). This is a valid selection, since *A. diaphanus* is not a *nomen nudum*, being accompanied by a short bibliographical reference, "Exot. fig. 50," linking it with the figure of *hyalinatus*. Herrich-Schaeffer seemingly intended *diaphanus* to be a substitute name for *hyalinatus*.

The males, and to a lesser extent the females, of species of *Abantiades* have antennal segments of characteristic forms, ranging from the almost circular lamellae of *A. leucochiton* (fig. 21) to the reduced type present in *A. aphenges* (fig. 25). The last-named species and *A. fulvomarginatus* stand somewhat apart from the rest of the members, and may be eventually placed in a separate genus. The hairy clothing of the segments is a distinctive character.

The following key is based chiefly on conspicuous characters in male specimens. The females are much larger, and have similar wing markings, in which the white bands are generally obscured or infuscated, and the ground-colours are less sharply defined.

KEY TO THE SPECIES OF ABANTIADES.

a. Forewings with conspicuous silvery-white bands.
  b. Terminal and discoidal white bands separate (in occasional examples of some species may be linked by a slender streak in the area between M_1 and M_2).
    c. Discoidal band strongly and irregularly dentate or broken.
      d. Ocellate markings present.
        e. Hindwings snowy-white .. .. .. *sericatus*
        ee. Hindwings not snowy-white.
          f. Tegumen of male with margin produced into a blunt point .. .. *ocellatus*
          ff. Tegumen of male with margin rounded *marcidus*
      dd. Ocellate markings absent.
        g. Ground colour uniformly brown, ochreous, or brick-red .. .. .. *hyalinatus* part.
        gg. Ground colour greyish-brown, white bands narrowly margined with black.. .. .. *aurilegulus*
        ggg. Ground colour broadly black in discoidal region, elsewhere grey, labyrinthine markings conspicuous.. .. *labyrinthicus* part.
    cc. Discoidal band with rather straight and entire margins.

h. Terminal white band broad.
i. Hindwings snowy-white .. .. .. *leucochiton*
ii. Hindwings slaty-grey .. .. .. *magnificus*
hh. Terminal white band narrow.
j. Margins of band irregularly dentate .. *hydrographus*
jj. Margins of band straight .. .. *latipennis*
bb. Terminal and discoidal white bands strongly conjoined.
k. Forewings without labyrinthine markings .. *barcas*
kk. Forewings with labyrinthine markings.
l. Ground colour grey .. .. .. *albofasciatus*
ll. Ground colour black, on margins grey.. *labyrinthicus* f. *swainsoni*

aa. Forewings without conspicuous silvery-white bands.
m. Forewings without markings .. .. .. *hyalinatus* part.
mm. Forewings with irregular white marks or lunules.
n. Costal margin tinged ochreous .. .. *fulvomarginatus*
nn. Costal margin concolorous.. .. .. *aphenges*

ABANTIADES SERICATUS sp. nov.

Fig. 27-28.

♂ Antennae ochreous-brown. Head, thorax, and legs grey, abdomen whitish. Forewings grey, with numerous black labyrinthine markings; silvery-white markings forming a large discal area and a narrower subterminal oblique band, which are both strongly margined with black and golden-yellow; black and

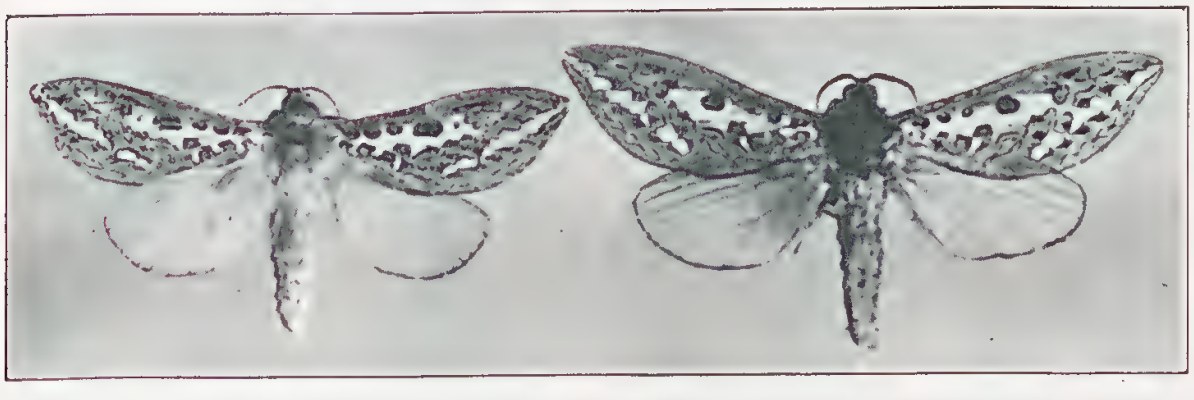


Fig. 27–28. *Abantiades sericatus* sp. nov. Type and paratype, males, Lake Grace.

yellow ocellate markings are present in median area. Hindwings white, clothed at base with dense white pubescence. Wings beneath white, tinged grey. Expanse, 60 mm.

Loc. Western Australia: Lake Grace (W. B. Barnard, 1929). 2 males.

This species is related to the following one (*A. ocellatus*), from which it

differs in the proportions of the antennae, in the form of wings, in the greater irregularity of the white markings, and in the yellow and black ringed spots.

ABANTIADES OCELLATUS sp. nov.

Fig. 29-30.

♂ Antennae brown, thorax grey, anterior margin of legs brownish-black, elsewhere clothed with mixed brown and white hairs; abdomen above white, suffused with pale pink, below greyish-white. Forewings brownish with silvery-white markings forming broad discoidal and oblique terminal bands, margined with velvety-black and pale ochreous; costal margin tinged ochreous; three or more velvety-black and ochreous annular marks in discoidal region. Hindwings creamy-white, termen suffused grey; basal hair dense, pale pink. Wings beneath grey with marked costal ochreous suffusion. Expanse, 62 mm.

Fig. 29–30. *Abantiades ocellatus* sp. nov. Type, a male, and allotype female, Denmark, Western Australia.

♀ Larger than male, similarly marked, hindwings and abdomen greyish-brown. Expanse, 101 mm.

Loc. Western Australia: Denmark. (Type, a male, B. No. 32, March 17, 1926, and the allotype female, B. No. 33, March 13, 1926, W. B. Barnard). 1 male, 2 females.

A second female, from Western Australia, without definite locality, has been examined.

Owing to the scantiness of material in this and the preceding species, the genitalia have not been dissected. Inspection suggests that in *A. sericatus* there are two processes widely separated on ventral margin of the tegumen; the anterior one is the smaller, and is preceded by a rounded eminence. In *A. ocel-*

latus this eminence is absent, the two marginal processes are closer together, and the anterior one is larger than the posterior.

A. ocellatus is from the *karri* forest districts, where there is a high annual rainfall (30-35 inches), whereas *A. sericatus* comes from semi-arid scrub and grass country with a low rainfall (below 15 inches).

ABANTIADES MARCIDUS sp. nov.

Fig. 31-34.

♂ Antennae dark chestnut-brown; head, thorax, abdomen, and legs grey. Forewings brownish-black, with numerous greyish-white labyrinthine markings; irregular discoidal longitudinal and oblique subterminal fasciae partly bordered with black. Hindwings grey, paler dense clothing at base and along costal margin. Wings below greyish-brown.

Fig. 31. *Abantiades marcidus* sp. nov. Type, a male, Adelaide.

♀ Similar to male; forewings brownish-black with numerous greyish-white labyrinthine markings; discoidal and subterminal markings of male almost obsolete, indicated by grey suffusions. Hindwings grey, dense clothing at base of wings paler. Expanse, 170 mm.

Loc. South Australia: Adelaide (April 4, 1928, N. B. Tindale, type, a male, and allotype female, I. 18657, in S. Aust. Mus.); Clarendon 4; Currency Creek 5; Fowler Bay. Victoria: Kilmore 4; Gunbower, 3, 4. 18 males, 10 females.

Apparently this species only appears in Adelaide on the first warm wet

night in April, when the males are attracted to lights, and may be captured with ease. The inland Victorian examples are indistinguishable from South Australian ones.

Fig. 32. *Abantiades marcidus* sp. nov. Allotype female, Adelaide.

The eggs and pupae of this species have been examined. The former are 0·6 mm. in diameter, spherical, and smooth; pale cream coloured when first laid, but changing to a dark slaty-grey colour. The pupa is 80 mm. in length and 15 mm. in greatest diameter; it is pale castaneous-brown in colour. (Fig. 34.)

33 34

Figs. 33–34. *Abantiades marcidus* sp. nov. Egg (× 20) and pupa, nat. size.

The pupal chamber is a silk-lined, vertical, subterranean shaft, 63–75 cm. in depth, leading to within a few millimetres of the surface. Pupation takes place at the base of this tunnel, and the pupa is capable of motion within the tube, being armed for this purpose with a series of ridges on several of the distal segments of the abdomen. The plug of earth closing the chamber is lifted like a hinged lid when the pupa thrusts half of its length out of the hole during emergence.

The Wirrangu natives of Fowler Bay, on the West Coast of South Australia,

dig up the larvae and pupae from around the roots of "gumtrees" and use them as food. The adults fly into the camp fires in great numbers; when this happens they are carefully raked out and eaten. They distinguish four stages: the small larvae, *pindi;* the full-grown larvae, *yalgunda;* the pupae, *tjirgi;* and the adult moths, *kunku.*

ABANTIADES HYALINATUS (Herrich-Schaeffer).

Fig. 24, 35-38.

Epiolus hyalinatus Herrich-Schaeffer, Lep. Exot., i, 1853, pl. xi, fig. 50, male.
Abantiades diaphanus Herrich-Schaeffer, *l.c.*, i, 1856, p. 5.
Charagia ingens Walker, List Lep. Ins. Brit. Mus., xxxii, 1865, p. 596, female (not male).
Pielus erythrinus Walker, *l.c.*, p. 599, male.
Pielus imperialis Olliff, Proc. Linn. Soc. N.S. Wales, ii (2), 1888, p. 1015, pl. 39; iii (2), 1889, pp. 641-642.
Pielus ingens Meyrick, Proc. Linn. Soc. N.S. Wales, iv (2), 1889, p. 1134.
Pielus hyalinatus Meyrick, *l.c.*, p. 1134 (part).
Pielus ingens [Pfitzner], Seitz Macrolepidoptera, Fauna indo-australica, ii, 1914, pl. 78a, female.

Fig. 35. *Abantiades hyalinatus* (Herrich-Schaeffer) male, Gisborne, typical form.

♂ Antennae brown; head, thorax, apex of abdomen, and legs ochreous; base of abdomen above with dense pink clothing. Forewings ochreous, a discoidal and an oblique subterminal series of silver-white marks margined with pale

brown. Hindwings ochreous, basal half with dense pink clothing, sometimes purple-tinged when fresh. Wings beneath ochreous. Expanse, 113 mm.

♀ Antennae brown; head, thorax, apex of abdomen, and legs ochreous; base of abdomen with dense pink clothing. Forewings unicolorous ochreous. Hindwings pale ochreous, basal half with dense pink clothing, usually purple-tinged when freshly caught. Expanse, 166 mm.

Fig. 36. *Abantiades hyalinatus* (Herrich-Schaeffer) female (type of *ingens* Walker), (British Museum).

The male described above is from Gisborne (G. Lyell, in Illidge Coll., I. 18659, in S. Aust. Mus.). It closely resembles Herrich-Schaeffer's figure in both colour and markings. The latter was wrongly recorded as coming from New Zealand. Gisborne is nominated as the typical locality. The female is from Moe. It agrees closely with the one described by Walker under the name of *ingens*. This was also wrongly localized as from New Zealand and mis-sexed.

Male examples exhibit several rather distinct colour forms, which differ also in the presence or absence of markings. Some of these forms have received names. They may be recognized by the following table:

a. Forewings with silvery markings.	
b. Ground colour dull ochreous	*hyalinatus*
bb. Ground colour brick-red	f. *imperialis*
bbb. Ground colour dark brown	f. *brunneus* form nov.
aa. Forewings without silvery markings. Ground colour ranging from dull ochreous to brick-red	f. *erythrinus*

Loc. (hyalinatus). New South Wales: Blue Mountains 2. Victoria: Gisborne 2; Moe 3. 12 males. New South Wales: Baulkham Hills 4; Blackheath 3. Victoria: Moe 2, 3. 10 females.

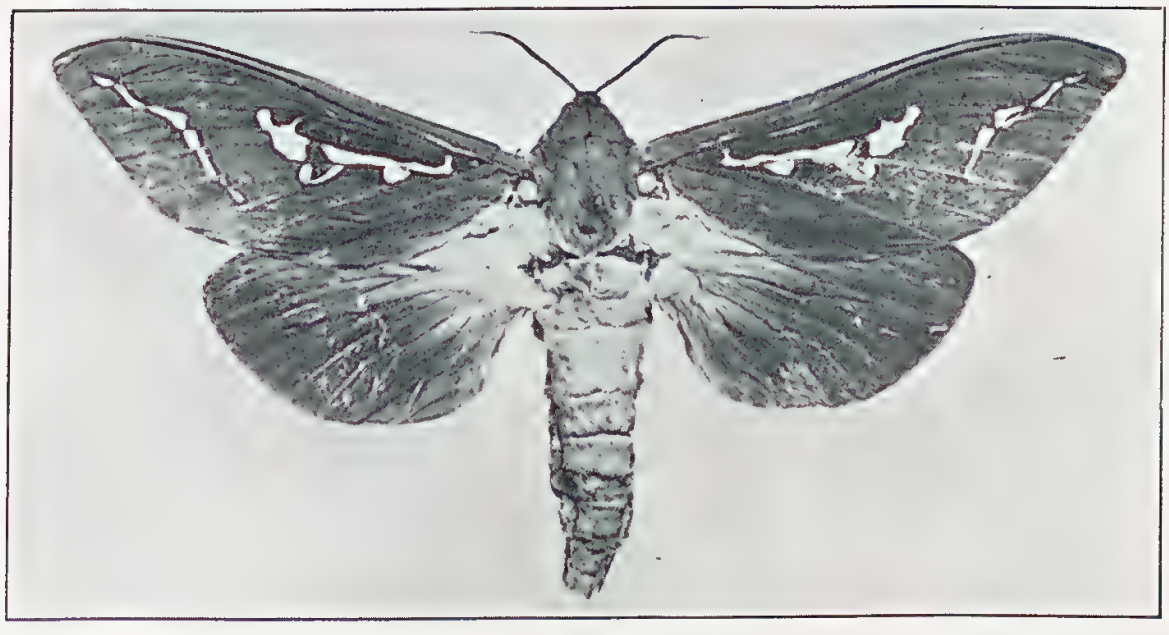


Fig. 37. *Abantiades hyalinatus* f. *brunneus* form nov. Type, male, Eaglehawk Neck.

f. *imperialis.* New South Wales: Sydney; Blackheath; Beecroft 3; Medlow 1. Victoria: Moe 2, 3. 10 males.

f. *brunneus.* Tasmania: Eaglehawk Neck 2 (type, I. 18660, in S. Aust. Mus., fig. 27); Snug River 2; Launceston. Victoria: Pomonal, 3. New South Wales: Katoomba; Tuncurry 3. 6 males.

f. *erythrinus.* Victoria: Moe 2; Meeniyan 4; Gisborne 3. New South Wales: Beecroft 3; Sydney. 11 males.

The form *brunneus* is the only one so far recorded from Tasmania; it might almost be regarded as a definite race. One similar example has been taken at Katoomba, another in Western Victoria, and a castaneous-brown form, doubtfully associated with this one, is represented by a single male from Tuncurry.

The females of *hyalinatus* are usually without markings, and vary little except in size. Four females from Moe range from 129 mm. to 173 mm. in expanse. On the forewings of one of the largest examples there are faint indications of the scrolled labyrinthine lines common to many species of the family. Some male examples of the typical and f. *imperialis* types also show traces of this additional ornamentation.

Fig. 38. *Abantiades hyalinatus* f. *erythrinus* (Walker). Type, male (British Museum).

Nothing is known concerning the life-history. The species appears early in the year, and is never abundant. Mr. C. G. L. Gooding has captured freshly-emerged specimens clinging to fence posts in the late afternoon after heavy rain has fallen.

ABANTIADES AURILEGULUS sp. nov.

Fig. 39-40.

♂ Antennae brown; head, thorax, legs, and abdomen pale brown. Fore-wings pale brown; longitudinal discoidal and subterminal oblique fasciae white, margined with darker brown. Hindwings pale brown. Wings below pale brown. Expanse, c.95 mm.

Loc. Western Australia: "Goldfields" (Type, I. 18662, in S. Aust. Mus., *ex* old coll.); Kalgoorlie (L. J. Newman). 2 males.

Superficially this species is close to the Eastern *A. barcas*, from which it differs in the form of the wings, the relative positions of the silvery-white markings, and in the genitalia. In the present species the tegumen bears a median process on the ventral margin, and the margin itself is finely serrated. In *A. barcas* there is a broad triangular process forming the greater part of the posterior half of the tegumen, and the margin is not serrated. In *A. aurilegulus* the valves are relatively slender at the apex, whereas in *A. barcas* they are much broader, almost spatulate in form when viewed from the side.

Both examples under examination are defective; the paratype is somewhat more brightly coloured and fresher than the type, but the wings are very battered.

Fig. 39. *Abantiades aurilegulus* sp. nov. Type, a male, Western Australia.

Fig. 40–41. 40. *Abantiades aurilegulus* sp. nov. male genitalia, composite photograph. 41. *Abantiades barcas* (Pfitzner) male genitalia.

ABANTIADES LABYRINTHICUS (Donovan).

Fig. 42-47.

Cossus labyrinthicus Donovan, Ins. N. Holl., 1805, t. 38, fig. 1, male.

Cossus argenteus Donovan, *l.c.*, fig. 2, female.

Pielus tasmaniae Walker, List Lep. Ins. Brit. Mus., vii, 1856, p. 1577, male.

Pielus swainsoni Scott, Aust. Lep., 1864, p. 11, pl. 4, male, female, and life-history.

Pielus hyalinatus Meyrick, Proc. Linn. Soc. N.S. Wales, iv (2), 1889, p. 1134 (part).

Pielus tasmaniae Swinhoe, East. Lep. Het., i, 1892, p. 289.

Pielus diversata Lucas, Proc. Roy. Soc. Queensland, xiii, 1898, p. 62.

[*Pielus*] *hyalinatus* [Pfitzner], Seitz Macrolepidoptera, Fauna indo-australica, ii, 1914, pl. 75b.

Fig. 42. *Abantiades labyrinthicus* (Donovan), male, Tasmania (type of *tasmaniae* Walker, in British Museum).

♂ Antennae reddish-brown; head, thorax, abdomen, and legs greyish-brown. Forewings dark brown; margins suffused with greyish-white, with numerous wavy brown lines forming a complex pattern; discoidal and subterminal oblique silvery-white streaks, margined with brownish-black; dark background conspicuous in a broad median band from near base to the subterminal white band, thence to apex. Hindwings greyish-brown, veins tinged ochreous. Wings beneath dull ochreous-brown. Expanse, 108 mm.

♀ Antennae reddish-brown; head, thorax, and greater part of abdomen above ochreous; legs orange; ventral surface and apex of abdomen dull orange.

Forewings pale brown; silvery-white bands of male almost absent, represented by ochreous-brown areas; rest of wings covered with waved or scrolled lines. Hindwings pale brown; at veins narrowly ochreous. Wings beneath ochreous-brown, margins ochreous. Expanse, 180 mm.

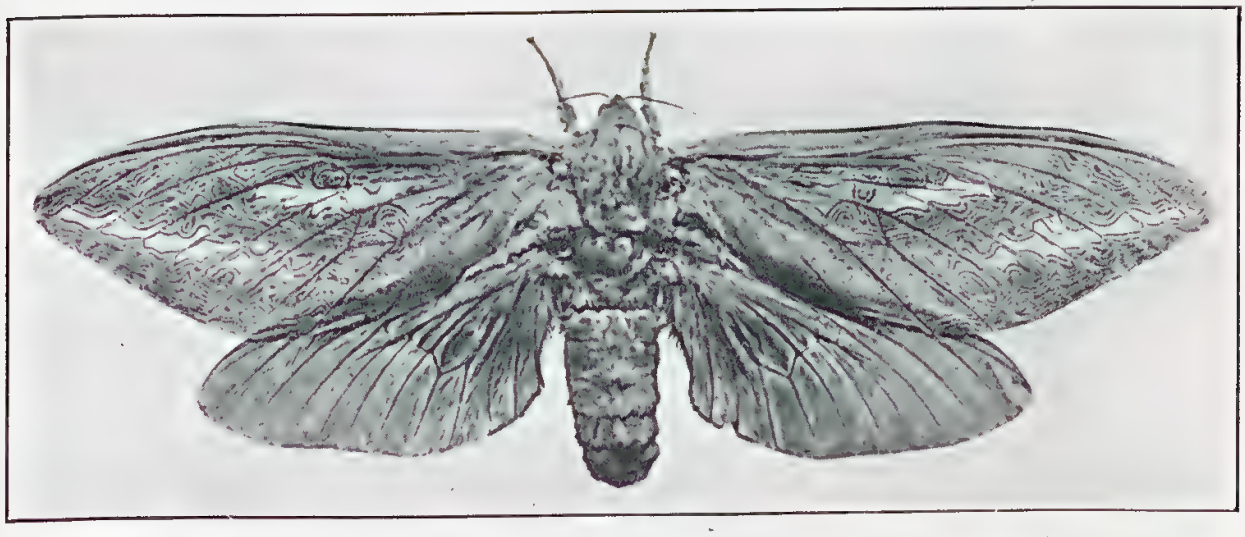


Fig. 43. *Abantiades labyrinthicus* (Donovan), female, New South Wales (supposed type of *argenteus* Donovan, in McLeay Museum).

Loc. Queensland: Rockhampton; Toowoomba 4. New South Wales: Ebor 1; Killara 3, 4; Sydney 4; Ash Island; Newcastle; Pambula 3; Pymble 3, 4; Beecroft 3. Victoria: Lorne 3; Trafalgar 2; Tanjil 1; Macedon 2; Bullengarook 1; Gisborne 1, 3; Narracan 3. Tasmania: Launceston. 64 males, 23 females.

The male described is from Mittagong (I. 18663, in S. Aust. Mus.), and was selected for its close similarity to the original figure, and, as the place of capture of Donovan's type is unknown, this is nominated as the type locality. The female (fig. 43) is an example labelled "New South Wales" (in the Macleay Museum), which may be Donovan's type of *argenteus*.

In one female example from Gisborne the markings on forewings are silvery-white, as in the male. The type female of *diversata* Lucas (fig. 45) is similarly distinguished. This may be a character of the southern race.

The Rockhampton example is very light in colour, and is not quite typical; with further material it may prove to be a separate race. Two generally distributed forms of this species may be distinguished; they are not specific, because intergrades occur, and both types may appear together in the one locality.

a. Forewings with discoidal and subterminal silvery-white bands separate .. .. *labyrinthicus*

aa. Forewings with silvery-white bands conjoined .. .. f. *swainsoni*

Fig. 44–45. *Abantiades labyrinthicus* (Donovan) Eltham, male and female (types of *diversata* Lucas).

The examples of f. *swainsoni* figured (fig. 46-47) are a male from Toowoomba (in Lyell Collection) and a female from Gosford (in Australian Museum Collection).

The type male of f. *swainsoni* (figured by Scott) is also in the Australian Museum, Sydney. The female associated with it by Scott has the two white marks separate, as in typical specimens of *labyrinthicus*. A photograph of Walker's type of *tasmaniae* is given (fig. 42), and the types of *diversata* Lucas, which are in the South Australian Museum (I. 14322), are figured (fig. 44-45). Besides the above-mentioned forms there may be found dwarfed, dull examples, dull greyish-brown in colour, with markings partly or quite obsolete. This is probably one of the most variable species; the male genital characters are, however, remarkably constant.

The name *labyrinthicus* has been wrongly applied by previous authors; this has led to much confusion in nomenclature. Reference to Donovan's original

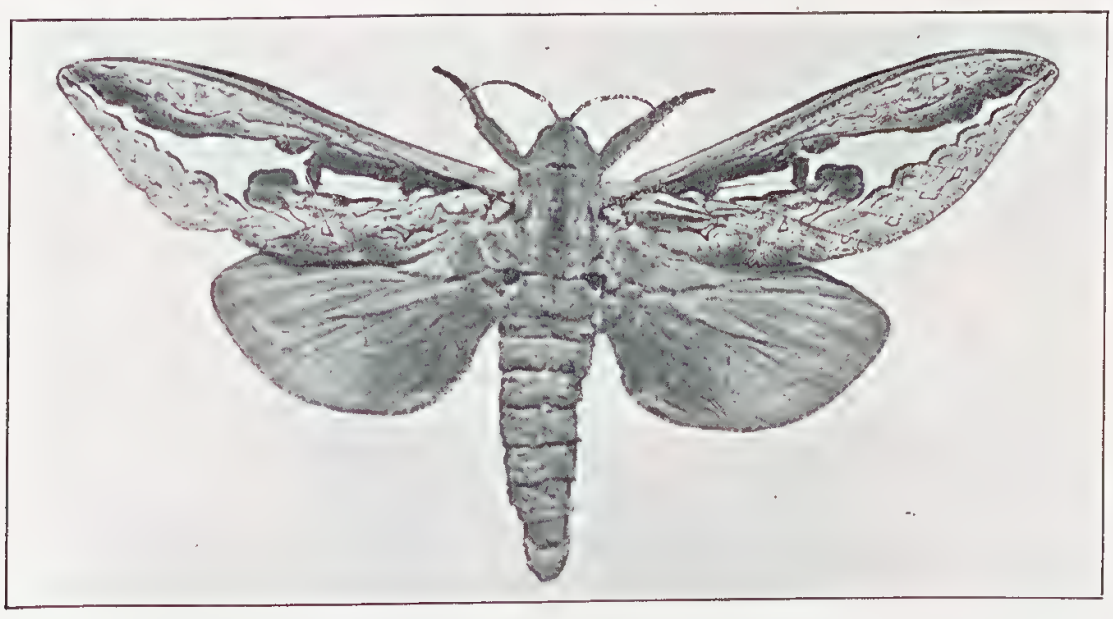


Fig. 46. *Abantiades labyrinthicus* f. *swainsoni* (Scott), male, Toowoomba.

Fig. 47. *Abantiades labyrinthicus* f. *swainsoni* (Scott), female, Gosford.

figures indicates that the present species was described, and under Article 31 of the International Rules the above synonymy seems inevitable. The life-history has been described and figured by Scott.

ABANTIADES LEUCOCHITON (Pfitzner).

Fig. 21, 48-49.

[*Pielus*] *leucochiton* [Pfitzner], Seitz Macrolepidoptera, Fauna indo-australica, ii, 1914, pl. 75a, male.

♂ Antennae brownish-black; head, thorax, and legs greyish-brown; base of abdomen white, towards apex brownish-black. Forewings brownish-black, with rather well-developed grey labyrinthine markings; discoidal longitudinal and subterminal oblique silvery-white fasciae, strongly bordered with black.

Fig. 48–49. *Abantiades leucochiton* (Pfitzner) male and female, Kewell.

Hindwings white, costa suffused grey, terminal margin narrowly dark brown, veins finely outlined brown; base of wing with dense snowy-white pubescence. Forewings beneath greyish-brown; discoidal fascia of dorsal surface marked below by long, white pubescence. Hindwing as above; bases of both wings covered with dense white pubescence. Expanse, 99 mm.

♀ Antennae brownish-black; head, thorax, and legs dark greyish-brown; abdomen paler. Forewings dark brownish, markings similar to male, discoidal

fascia partly obscured, bordered dark brown. Hindwings greyish-brown, base with dense greyish-white pubescence. Expanse, 146 mm.

Loc. Victoria: Kewell 3, 4. 6 males, 2 females.

The place of capture of Pfitzner's type is apparently unknown. The male and female described above are from Kewell (I. 18664, in S. Aust. Mus.); therefore this is nominated as the typical locality.

According to Mr. J. A. Hill the larva of this species feeds on the roots of the bull oak *(Casuarina Luehmannii)*; the imago usually emerges early in April.

ABANTIADES MAGNIFICUS (Lucas).

Fig. 50-51.

Pielus magnificus Lucas, Proc. Roy. Soc. Queensland, xiii, 1898, p. 61.

♂ Antennae reddish-brown; head, thorax, ventral surface of abdomen, and legs smoky-grey; dorsal surface of abdomen dull brown. Forewings smoky-

Fig. 50. *Abantiades magnificus* (Lucas), type, a male, Melbourne.

grey with obscure markings; broad longitudinal discoidal and oblique subterminal silvery-white streaks margined with black. Hindwings dull brown, at base ochreous-brown. Wings beneath dull brown. Expanse, 136 mm.

♀ Antennae reddish-brown; head, thorax, apex of abdomen, and legs smoky-grey, tinged ochreous; base of abdomen paler, ochreous-grey. Forewings smoky-grey with obscure markings; the broad white streaks of male indicated,

but dull grey in colour. Hindwings dark grey, at base tinged ochreous. Wings beneath dull grey, at base tinged ochreous. Expanse, 184 mm.

Loc. Victoria: Melbourne; Warragul 4; Trafalgar 4; Moe 2; Beaconsfield; Gisborne 12; Narnargoon. New South Wales: Snowy River, near Mount Kosciusko (4,000 feet) 1. 7 males, 6 females.

Fig. 51. *Abantiades magnificus* (Lucas), female.

Lucas's male example (I. 18655, in S. Aust. Mus.) has been redescribed and figured; the measurement (125 mm.) given by him for the expanse of the wings was obtained by his usual method, i.e., from tip to tip of the forewings as "set." The female described by him cannot be recognized in his collection; it probably did not belong to the present species. The above-mentioned example is from Beaconsfield (I. 18665, in S. Aust. Mus.). A similar example from Gisborne, in the Lyell Collection, has been figured.

ABANTIADES HYDROGRAPHUS (Felder).

Fig. 20, 23, 52-53.

Pielus hydrographus Felder, Reise Novara, Lep., 1868, pl. lxxx, fig. 3, female.
Trictena labyrinthica Meyrick, Proc. Linn. Soc. N.S. Wales, iv (2), 1889, p. 1135 (in synonymy only).

♂ Antennae brownish-black; head, part of thorax, abdomen (except base), and legs pale brown; lateral parts of thorax grey; base of abdomen clothed with dense pink down. Forewings with a broad central area brown; marginal areas and part of central area greyish-brown, with usual crenulate markings; a well-

defined longitudinal discoidal and oblique subterminal silvery-white band, margined with brownish-black. Hindwings distally pale brown, paler near costa; basal third clothed with dense pink down. Wings beneath brown, basal half clothed with dense pink down. Expanse, 149 mm.

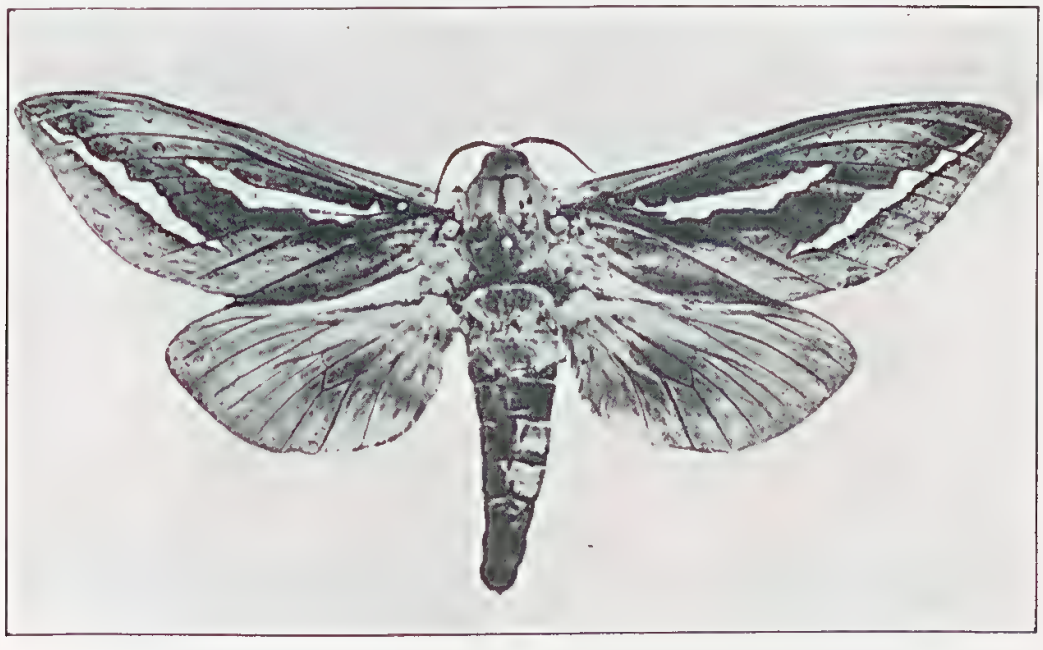


Fig. 52. *Abantiades hydrographus* (Felder), male.

♀ Colour and markings similar to male; down on wings and at base of abdomen almost white. Expanse, 199 mm.

Loc. Western Australia: Swan River; Donnybrook 3; Waroona 3, 4. 5 males, 7 females.

Fig. 53. *Abantiades hydrographus* (Felder), type, a female (in Tring Museum Collection).

The male example described is from Swan River (I. 18666, in the S. Aust. Mus.). Felder's type, a female, which is now preserved in the Tring Museum, is also figured. A female from Waroona (April 2, 1912, G. F. Berthoud, in Lyell Collection) agrees very closely with Felder's example.

This species has been wrongly recorded as from Adelaide. The error has arisen because Felder associated a male of *Trictena argentatus* from Adelaide (Angas Collection) with his type of *hydrographus*, which is from "Australia." I am indebted to Dr. K. Jordan, of the Tring Museum, for directing my attention to the origin of this mistake, and for furnishing a photograph of the example.

ABANTIADES LATIPENNIS sp. nov.

Fig. 54-56.

♂ Antennae castaneous; head, thorax, and abdomen pale brown; legs ochreous, with brown fringe of down. Forewings pale brown, with plain discoidal and terminal oblique silvery-white bars margined with brownish-black;

Fig. 54. *Abantiades latipennis* sp. nov., type, a male.

some traces of labyrinthine marks on posterior margin. Hindwings pale brown, clothed at base with dense pink down. Wings beneath pale brown; costal margins ochreous. Expanse, 78 mm.

♀ Antennae castaneous; head, thorax, and abdomen greyish-brown; legs ochreous, with dark brown hairy fringes. Forewings dark brown; costal margin dull ochreous; silvery-white markings as in male, but with more irregular margins; traces of labyrinthine markings over much of wing. Hindwings dark

Fig. 55. *Abantiades latipennis* sp. nov., allotype female.

brown, costal margin ochreous; pink hairs confined to base. Wings beneath brown, costal margins ochreous. Expanse, 150 mm.

Loc. Victoria: Lorne 3, type a male, in Lyell Collection, allotype female 3 (I. 18667, in S. Aust. Mus.); Pomonal 3; Mount Mistake. Tasmania: Zeehan 2; Eaglehawk Neck 2; Launceston. 10 males, 1 female.

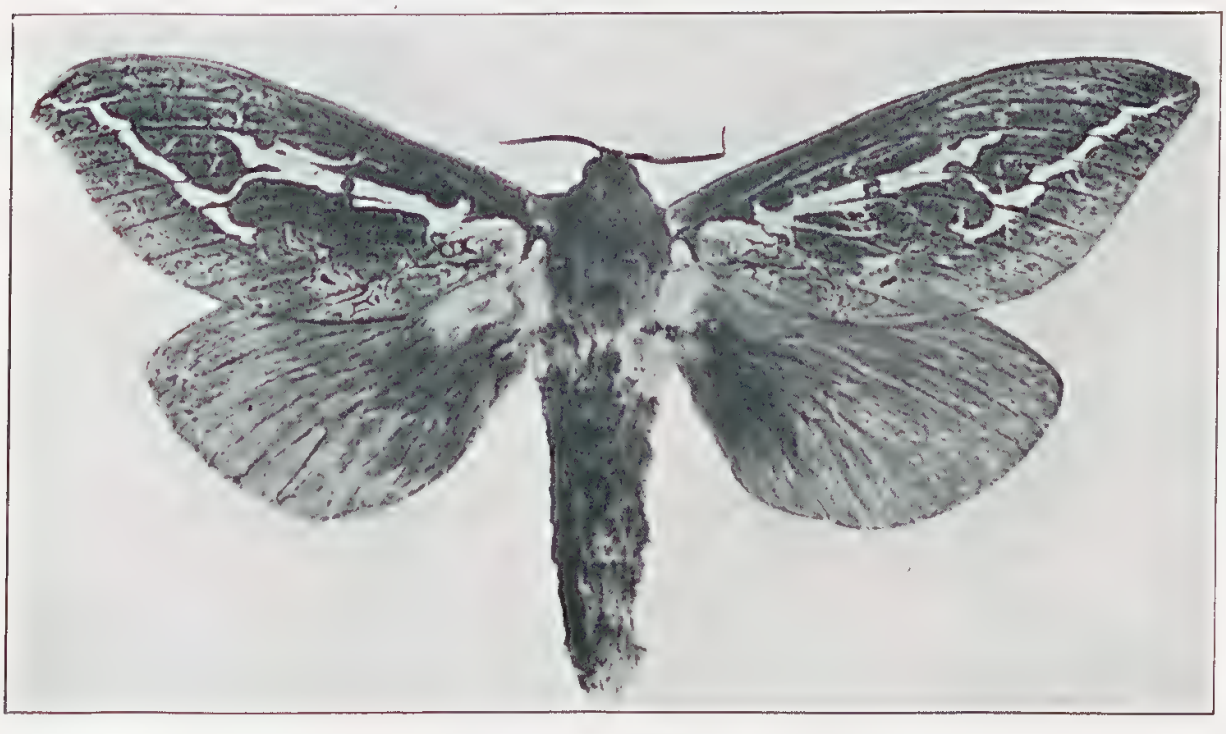


Fig. 56. *Abantiades latipennis* sp. nov., male, aberrantly marked.

The sexes differ markedly in wing dimensions and in the form of the hindwings; in some other ways the resemblances are close, and, as a paratype male and the allotype female were taken in the same place within twenty-four hours of each other, there can be little doubt that they are conspecific.

The Tasmanian examples are usually darker than the mainland ones, and the obscure labyrinthine markings on forewings are more evident.

Fig. 56 shows an aberrant example in which the white marks of forewings are conjoined.

ABANTIADES BARCAS (Pfitzner).

Fig. 57.

[*Pielus*] *barcas* [Pfitzner], Seitz Macrolepidoptera, Fauna indo-australica, ii, 1914, pl. 75 d, e, male and female.

Fig. 57. *Abantiades barcas* (Pfitzner), male, Sydney.

♂ Antennae brown; head, thorax, abdomen, and legs pale brown. Forewing pale brown, costal margin somewhat darker; a broad, irregular, semicircular silver-white band margined with dark brown extends from near base to apex; hindwings pale brown, at base with dense, faintly pinkish pubescence. Wings beneath pale brown. Expanse, 112 mm.

♀ Antennae brown; head, thorax, and legs ochreous-brown; abdomen above greyish-brown, at apex ochreous-brown, beneath brownish-ochreous. Forewings brown, with termen and principal veins tinged ochreous. Traces of conjoined terminal and median silver bands of male also present. Hindwings brown,

at base somewhat paler. Wings beneath greyish-brown, with termen and principal veins tinged brownish ochreous. Expanse, 166 mm.

Loc. Queensland: Stanthorpe. New South Wales: Duntroon 3; McQuarrie Fields; Orange; Sydney 3. Victoria: Rutherglen 4; Benalla. 11 males, 1 female.

The examples described are from Sydney and McQuarrie Fields (I. 18668, in S. Aust. Mus.).

ABANTIADES ALBOFASCIATUS (Swinhoe).

Fig. 58-59.

Pielus albofasciatus Swinhoe, East. Lep. Het., i, 1892, p. 289, male and female.

♂ Antennae dark brown; lamellae ovoid, twice as long as wide. Head, thorax, and apical half of abdomen brown, base clothed with pink tinged white down. Legs greyish-brown. Forewings brown, with numerous greyish-white labyrinthine markings; a broad, longitudinal white band extends from base to apex, a thin submarginal white band along part of termen. Hindwings grey, base clothed with white down. Expanse, 96 mm.

Fig. 58. *Abantiades albofasciatus* (Swinhoe), type, a male (in Oxford University Museum Collection).

♀ Similar to male. Labyrinthine markings more conspicuous. Expanse, 156 mm.

Loc. Western Australia: Swan River. (Types in Oxford University Museum.) 1 male.

The type examples and a single unlocalized male from Western Australia are the only specimens known. The species is quite a distinct one.

Fig. 59. *Abantiades albofasciatus* (Swinhoe), allotype female (in Oxford University Museum Collection).

ABANTIADES FULVOMARGINATUS sp. nov.

Fig. 60-62.

♂ Antennae ochreous; head and thorax brownish-black; abdomen grey. Forewings dark grey, with dull subhyaline-whitish markings; four subocellar markings in discoidal region dull black; costal margin faintly ochreous. Hind-

Fig. 60–62. *Abantiades fulvomarginatus* sp. nov. 60 type, a male, Lennox, 61 allotype female, Lennox. 62 paratype male, Denmark, W.A.

wings with costal margin broadly pale ochreous, terminal half grey. Wings beneath, with costal margins, ochreous, otherwise grey. Expanse, 44 mm.

♀ Forewings grey, with paler cryptic markings; a darker grey suffusion in discoidal area. Hindwings pale grey. Wings below pale grey; costal margins faintly ochreous. (Head and antennae missing in allotype female.) Expanse, 69 mm.

Loc. Western Australia: Lennox 4 (type, a male, and allotype female); Denmark 4. 2 males, 1 female.

The second male example is larger (expanse, 61 mm.) than the type, and the dark markings are slightly larger and more suffused. This species is distinct from *A. ocellatus* in the shape of the wings and in the general disposition of the markings.

ABANTIADES APHENGES (Turner).

Fig. 63-64.

Pielus aphenges Turner, Trans. Roy. Soc. S. Aust., xxxviii, 1904, p. 247.

♂ Antennae pale ochreous brown; head, thorax, and legs dark chocolate-brown; abdomen greyish-brown. Forewings uniformly dark chocolate-brown, with numerous whitish lunules and short streaks. Hindwings greyish-brown. Wings beneath greyish-brown; costa of hindwings paler. Expanse, 56 mm.

Fig. 63–64. *Abantiades aphenges* Turner, male, Manly, female, Roseville.

♀ Similar to male; markings on forewings paired instead of single; abdomen somewhat darker than in male. Expanse, 86 mm.

Loc. New South Wales: Roseville 3, 4; Manly 4; Killara 4; Hornsby 4; Beecroft 3. 7 males, 2 females.

The male described is from Manly (I. 18669, in S. Aust. Mus.); the female

is from Roseville, and is in the Lyell Collection. The type has not been seen; its small wing expanse (64 mm.) suggests that it may be a male example.

Dr. G. A. Waterhouse states that at Killara this species is found shortly after dusk on one or more dark, wet evenings in April. It flies close to the ground, and is difficult to secure.

NOTES ON AUSTRALIAN MOLLUSCA, WITH DESCRIPTIONS OF NEW GENERA AND NEW SPECIES

By BERNARD C. COTTON, Conchologist, South Australian Museum.

Fig. 1-9.

The following notes, unless otherwise stated, deal with specimens dredged by Sir Joseph C. Verco and donated by him to the South Australian Museum.

Family TRIPHORIDAE.

South Australian members of this Family were treated in a previous paper (1) where three new genera, *Eutriphora, Isotriphora,* and *Hypotriphora* were introduced. The following species are additions to the Western Australian list: *Isotriphora tasmanica* Tenison Woods, *I. disjuncta* Verco, *Notosinister innotabilis* Hedley, *N. latilirata* Verco, *N. armillata* Verco, *N. pfeifferi* Crosse and Fischer, *Eutriphora epallaxa* Verco, all occurring as far West as King George Sound but apparently no further. *Isotriphora aureovineta* Verco occurs as far west at Rottnest, and *Notosinister granifera* and *Cautor obliqua* May were obtained at 80 miles West of Eucla.

Family VERMITIDAE.

Vermicularia waitei Hedley was dredged in 40 to 150 fathoms at a number of localities between Beachport, South Australia, and 80 miles West of Eucla, Western Australia; *Siliquaria anguina* Linn. in 100 fathoms at St. Francis Island, South Australia, and 90 miles West of Eucla, Western Australia; *Lilax nucleogranosum* Verco was obtained in 80 fathoms, 80 miles West of Eucla.

Family IANTHINIDAE.

Specimens of *Ianthina violacea* were taken at numerous localities between Beachport, South Australia, and Hopetoun, Western Australia. The shells of *I. capreolata* Montrouzier occurred at many localities between Cape Jaffa, South Australia, and Albany, Western Australia, down to 300 fathoms, while many hundreds of living specimens were obtained at Esperance, Western Australia, in shallow water.

(1) Cotton and Godfrey, South Aust. Naturalist, vol. xii, No. 4, Sept., 1931, p. 51.

FAMILY MERRIIDAE.

Naricava ligata Recluz and *N. vincentiana* Angas were both obtained as far West as King George Sound, Western Australia.

Fig. 1. *Lyria kimberi* sp. nov. ventral view. (× 2).
Fig. 2. *Lyria kimberi* sp. nov. protoconch. (× 8).
Fig. 3. *Lyria kimberi* sp. nov. dorsal view. (× 2).

FAMILY VOLUTIDAE.

LYRIA KIMBERI sp. nov.

Fig. 1, 2, and 3.

Shell ovately-fusiform, mitraeform, solid; unicoloured chestnut-brown fading into cream near the outer lip; columella and aperture pure white; protoconch (fig. 2) large, globose, smooth, translucent white, of one-and-a-half turns after which commences the longitudinal plicae of the adult; spire acuminate, one-quarter of the total length of the shell; whorls validly longitudinally sinuously ribbed; sixteen ribs on the body-whorl and the same number on the penultimate, narrower than the interstices; base spirally grooved; aperture elongate-ovate, with a slightly recurved anterior canal; outer lip thick; columella triplicate at the base, then numerously, minutely plicate above, a small tooth near the posterior end.

Loc. Port Lincoln. Dredged in shallow water (probably 2–6 fathoms) (Mr. Ventura). Type (unique), height 30 mm., diam. 16 mm. Reg. No. D. 10185, S. Aust. Museum.

Ten species of true *Lyria* are recorded from various parts of the world, but only five are strongly longitudinally ribbed. One of these is the Australian

Lyria multicostata which is more like *L. kimberi* than any other species. Compared with *Lyria multicostata* Broderip, the present species is but half the size; it is unicoloured without any spiral bands or dotted lines; protoconch larger, pure white (not dark purple); the longitudinal ribs narrower, less numerous, and more sinuous.

Collected by Mr. Ventura, of Port Lincoln, and donated to the South Australian Museum by Mr. W. J. Kimber, after whom it is named.

The specimen is perfect, in a fresh condition, and Mr. Ventura informs Mr. Kimber that it is common about Port Lincoln. It is an extraordinary circumstance that no member of the South Australian Malacological Society has ever collected or seen the species before.

FAMILY CERITHIIDAE.

The species *granarium* Kiener and *icarus* Bayle (= *tenue* Sowerby) may be placed in the genus *Cacozeliana Strand* (2) (= *Cacozelia* Iredale preocc.). The reference to Strand is omitted from the Zoological Record. *Bittium lawleyanum* Crosse is generically distinct from these species, and is here made the type of a new genus *Paracerithium* described below.

In the genus *Zeacumantus* Finlay 1926 may be located *diemenensis* Quoy and Gaimard, *cerithium* Quoy and Gaimard, and *estuarinum* Tate. *"Cerithiopsis" geniculosus* is the genotype of *Altispecula* Powell 1930, and *"Donovania" fenestrata* Tate and May the genotype of *Gatliffena* Iredale 1929. The type of *Seilarex* Iredale 1924 is *turritelliformis* Angas, and *attenuata* Hedley is a synonym. *Cerithium monachus* Crosse and Fischer differs somewhat from the type of the tropical genus *Plesiotrochus*, and is here placed in a new genus *Hypotrochus*. Other South Australian species should read: *Ataxocerithium serotinum* A. Adams, *Joculator cessicus* Hedley, *Zaclys dannevigi* Hedley, *Notoseila crocea* Angas, *Notoseila albosutura* Tenison-Woods.

PARACERITHIUM gen. nov.

Shell imperforate, elongate, turriculate, suture slightly impressed; whorls slightly convex and spirally grooved, sometimes developing weak axial undulations; protoconch brown, polished, horny; aperture oval; outer lip slightly notched. Type, *Bittium lawleyanum* Crosse.

HYPOTROCHUS gen. nov.

Shell thin, subtranslucent, whorls bicarinate, ventricose, longitudinally plicate, beset with varices and spirally striate; aperture produced anteriorly into a short, narrow canal; protoconch very small, horny, smooth, of two-and-a-half

(2) Strand, Archiv. f. Naturgesch Jahrb. 92 Abt. A Heft 8, 1928.

whorls. Type, *Cerithium monachus* Crosse and Fischer. *Hypotrochus* is the Southern representative of the tropical genus *Plesiotrochus* Fischer 1878. The type of *Plesiotrochus* is *souverbianus* Fischer, and specimens from Lifou, Loyalty Island, show this to be shorter and comparatively wider, with almost straight-sided, not ventricose whorls. *Hypotrochus* is common in the Flindersian Region, but rare in New South Wales, which may be regarded as the northern limit. *H. monachus* is very variable in the length of the spire and validity of the varices. A distinct species of *Hypotrochus* is here described as *H. pnetricincta* sp. nov.

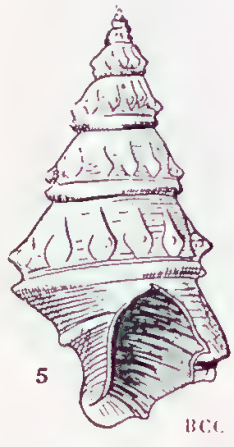


Fig. 4. *Octopus flindersi* sp. nov. beaks. (Nat. size).
Fig. 5. *Hypotrochus penetricincta* sp. nov. (× 4).

HYPOTROCHUS PENETRICINCTA sp. nov.

Fig. 5.

Thin, conical, subtranslucent; whorls sharply carinate, little ventricose, longitudinally plicate, ten plications on the penultimate whorl; spirally striate; body whorl bicarinate; base spirally ribbed, with a weak keel near the columella; colour yellowish, spotted with chestnut on the keels of the whorls.

Loc. Edithburg, South Australia; 9 fathoms, 11 mm. x 5 mm. (type, in S. Aust. Mus., Reg. No. D 10165). Gulf St. Vincent, South Australia, to King George Sound, Western Australia, down to 55 fathoms.

Diagnosis. Differs from *H. monachus* Crosse and Fischer in being more slender, having sharper keels and the additional keel on the base. It is rather less variable than *H. monachus*. *H. penetricincta* resembles *P. pagodiformis* in shape, but has the additional basal keel.

HYPOTROCHUS MONACHUS Crosse and Fischer.

Cerithium monachus Crosse and Fischer, Journ. de Conch, 1864, p. 347.

Loc. South Australia; Beachport to St. Francis Island, down to 100 fathoms. Western Australia; King George Sound and Abrolhos Island.

NEODIASTOMA gen. nov.

Shell turriculate, elongate; protoconch of two smooth homostrophe whorls; earlier shell whorls varied, the varices becoming obsolete later; weakly axially plicate and finely spirally ribbed, the primary ribs being about twelve on the body whorl and six on the spire whorls with other less conspicuous interstitial riblets; suture impressed; aperture oblique, inner lip glazed, more thickly glazed anteriorly, the two degrees of glazing separated by a sharp columella plait; outer lip slightly notched anteriorly near the columella; colour white, flecked on the spiral ribs with rectangular chestnut spots.

Type *Mesalia melanioides* Reeve. Esperance Bay, Western Australia.

Neodiastoma differs from *Diastoma* in the anterior notch of the outer lip, and from *Mesalia* in being varied.

This genus had probably better be placed in the Family *Cerithiidae* for the present. The possession of a homostrophe protoconch disallows it location in the *Pyramidellidae.*

NEODIASTOMA MELANIOIDES Reeve.

Mesalia melanioides Reeve, Conch, Icon., v, pl. 1, fig. 3, 1849.

Mesalia exilis Sowerby, An. Mag. Nat. Hist., xii, p. 236, pl. iii, fig. 9, 1913.

Reeve described this species from unknown locality. Sixty-four years later Sowerby described *Mesalia exilis* from West(ern) Australia. Smith compared the type specimen of each species and testified to their specific identity, and remarked, "This species (*M. melanioides* Reeve) of which only the shell is known, has an altogether different aspect from the type of *Mesalia* (*Mesalia brevialis* Lamarck)." Sowerby writes: "The actual position of this remarkable shell is uncertain, but I provisionally place it in *Mesalia* on account of the characteristic basal sinus." Tate advocates the location of *melanioides* in the fossil genus *Diastoma* which occurs in the Eocene and Oligocene of the Paris basin. He records the new species *Diastoma provisi* as occurring in the Miocene at Hallett's Cove, and Older Pliocene at Dry Creek bore, South Australia. The fossil *provisi* Tate is much more like the living *Neodiastoma melanioides* than it is like the type of *Diastoma.* The type of *M. exilis* came from Esperance Bay, and Sowerby confirms this in a letter to Sir Joseph Verco. An examination of some fine specimens of *melanioides* from the type locality shows their closer relation to the fossil genus *Diastoma* than to *Mesalia.*

Loc. South Australia: Thistle Island, 15 fathoms; Spencer Gulf, 12 and 10 fathoms; Sir Joseph Banks Island, St. Francis Island, Petrel Bay, 6 fathoms. Western Australia: Esperance Bay.

FAMILY ATLANTIDAE.

ATLANTA ROSEA Eydoux and Souleyet.

Four shells of this species were dredged by Verco in January, 1905. The largest specimen has the "ligne rose à la base de la carène" as mentioned in the type description. This is the first record of the family *Atlantidae* occurring on the southern coast of Australia. Hedley previously recorded the species from New South Wales: Cape Three Points 41-50 fathoms, and Port Kembla 63-75 fathoms.

Loc. South Australia: 35 miles south-west of the Neptune Islands, 104 fathoms, in sandy ooze; east longitude 135·40, and south latitude 35·25. Four specimens.

FAMILY CARINARIIDAE.

PTEROSOMA PLANUM Lesson.

One juvenile specimen dredged by Verco adds another genus and species to the South Australian list.

Loc. South Australia: Beachport, 40 fathoms.

FAMILY CAVOLINIIDAE.

Only two species of *Pteropoda* have been recorded from Western Australia, *Clio pyramidatus* Linne and *Cavolina longirostris* Lesueur. None have been recorded from the southern coast of that State. Verco dredged the following species:

CAVOLINIA TRISPINOSA Lesueur.

Loc. Western Australia: 80 miles west of Eucla, 80 fathoms. Two perfect specimens, the larger measuring 7 mm. x 6 mm.

CAVOLINIA TRIDENTATA Forskal.

Loc. Western Australia: 80 miles west of Eucla, 80 fathoms, and 120 miles west of Eucla, 300 fathoms. Four specimens, the largest reconstructed graphically, measures 17 mm. x 13 mm.

CLIO SUBULA Rang.

Loc. Western Australia: 80 miles west of Eucla, 80 fathoms. Many fragments.

CLIO PYRAMIDATUS Lesueur.

Loc. Western Australia: 80 miles west of Eucla, 80 fathoms. Two fragments.

CLIO BALANTIUM Rang.

Loc. Western Australia: 120 miles west of Eucla, 300 fathoms. Three fragments.

SPIRATELLA INFLATA d'Orbigny.

Loc. Western Australia: 80 miles west of Eucla, 80 fathoms. Six specimens.

FAMILY OCTOPODIDAE.

It is almost impossible to obtain accurate measurements from fresh specimens of *Octopus*, as they are so plastic, the body portion particularly, assuming different shapes. As there is no rigid portion in the whole animal except the beaks, it is obvious that measurements for diagnostic purposes are difficult to obtain. Probably more accurate comparative dimensions can be obtained after the animal has been immersed for a few days in the undermentioned solution, which as a preservative seems as permanent as spirits or formalin. The *Octopus* should be suspended in the solution by the tip of the arms so as to avoid uneven pressure on the body, which would result in distortion. Experiments with fresh meat and various kinds of *Mollusca* have proved the following formula very good:

Glycerine	1 part.
Methylated Spirits	2 parts.
Water	5 parts.
Formalin	·04 part.

This solution will preserve Nudibranchs, Cephalopods, and other soft bodied animals without shrinking them greatly or making them unduly hard.

OCTOPUS FLINDERSI sp. nov.

Fig. 4 and 6.

Body oval, somewhat pear-shaped, narrowest at the junction with the head, which is narrower than the body; arms in the order 3, 1, 2, 4, all more or less damaged, and average 75% of the total length of the animal, which is 1000 mm. long from the aboral end of the body to the tip of the longest arm; largest suckers average 26 mm. diameter, or 15% of the mantle length; web shallow, of subequal depth; funnel organ W shaped; skin smooth, though the animal can wrinkle it somewhat to produce a weak granulation sometimes seen in preserved specimens; skin otherwise devoid of sculpture; colour yellowish, changing to a reddish-brown hue on the dorsum and outer surface of the arms, where it is also irregularly maculated with brown spots; colour changeable in life, sometimes assuming a bluish-grey tinge, which is the usual colour of preserved specimens; beaks, illustrated natural size at figure 4.

Loc. South Australia: Largs Bay (type, in S. Aust. Mus., Reg. No. D 10169), Robe, Port Noarlunga, Marion Bay (P. Nichols), and Encounter Bay (Prof. J. B. Cleland). Common in the south-east of South Australia during the summer.

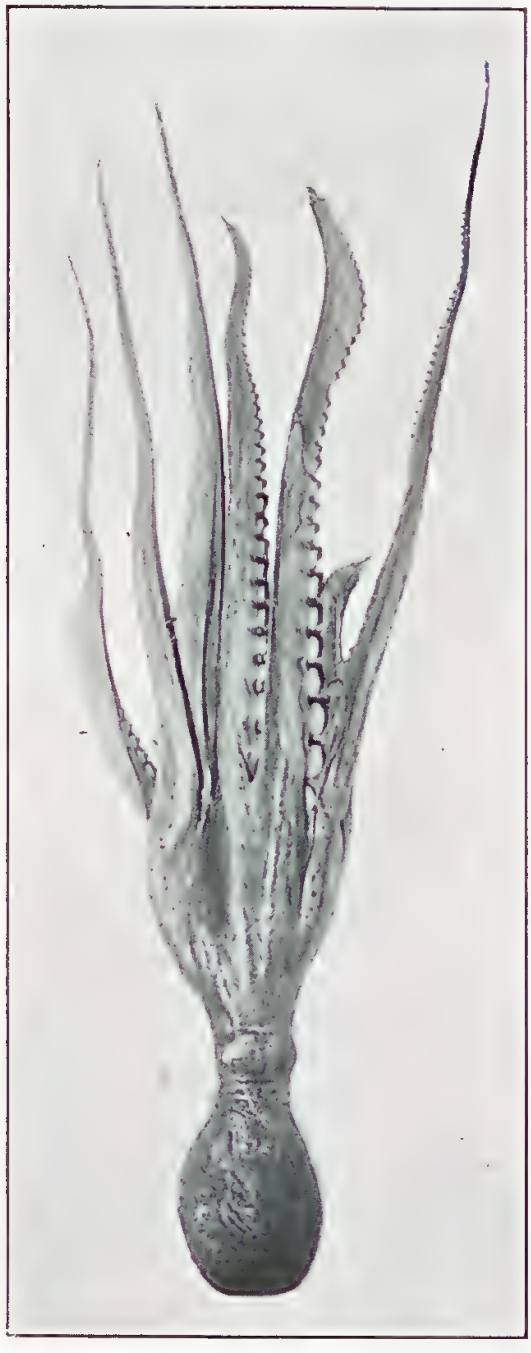


Fig. 6. *Octopus flindersi* sp. nov. (× 0·122).

Unfortunately all the specimens personally examined were females, so that it is not possible to give a description of the hectocotylized arm in this paper.

The largest species of *Octopus* so far recorded from South Australia. It resembles *Octopus vulgaris* Lamarck but differs in having stouter, shorter arms, comparatively larger suckers, and smooth skin.

OCTOPUS PALLIDA Hoyle.

Octopus boscii var. *pallida* Hoyle, Ann. Mag. Nat. Hist. (5), xv, p. 223.

Polypus variolatus Blainville, Berry, Biol. Res. Endeavour, iv, pt. 5, p. 278, 1918, pls. lxxix-lxxxii.

Polypus variolatus Blainville, Cotton, Rec., S. Aust. Mus., iv, No. 1, p. 128, 1928.

Australian distribution: New South Wales, Victoria, Tasmania, and Western Australia in the Great Australian Bight.

Mr. H. M. Hale found a juvenile specimen of this species on the beach at the outer Harbour, and an adult was dredged by me in 5 fathoms off Semaphore. Both agree with Hoyle's description and Berry's illustration.

HAPLOCHLAENA MACULOSA Hoyle.

Octopus pictus Brock, Anatomie und Systematik der Cephalopoden, p. 603, pl. 37, fig. 3, 1882 (preocc. Blainville, 1828).

Octopus maculosus Hoyle, Proc. Roy. Phys. Soc. Edin., vii, p. 319, pl. vi, 1883.

Polypus pictus Brock, Cotton, Rec. S. Austr. Mus., iv., No. 1, p. 128, 1928.

Loc. The Australian distribution of this species is New South Wales, South Australia, and Tasmania.

Specimens obtained from Kangaroo Island and Gulf St. Vincent, South Australia, give the following data: The arms have the order of length 4, 3, 2, 1. The umbrella extends slightly higher between the lateral arms. One specimen has the umbrella comparatively higher on the left than the right side. Hoyle writes: "The example in the British Museum from Kangaroo Island has a curious, thin, pointed process about 6 mm. long at the aboral end of the body, which led to its receiving a special MS. name, but in all other respects it agrees so closely with *Octopus pictus* Brock that I am inclined to regard it as an individual abnormality." Specimens preserved in formalin or spirit sometimes have a short, thin, pointed process or "tail" about 3 mm. in length, but this has not been noticed in fresh specimens, though some are obtusely pointed at the aboral end of the body. The species is very variable, and it is highly probable that *H. lunulata* Quoy and Gaimard is the same species, when *H. maculosa* Hoyle, described fifty-one years later, would become a synonym.

FAMILY SEPIIDAE.

Iredale (3), 1926, recorded six genera, five species and four subspecies of cuttlefish bones from North-West Islet. Since this Mr. W. J. Kimber collected there, and was fortunate in securing one perfect specimen of a cuttle bone quite

(3) Iredale Aust. Zoologist, vol. iv, p. 237, 1926.

distinct from any species so far recorded. It is here described as a new genus and species.

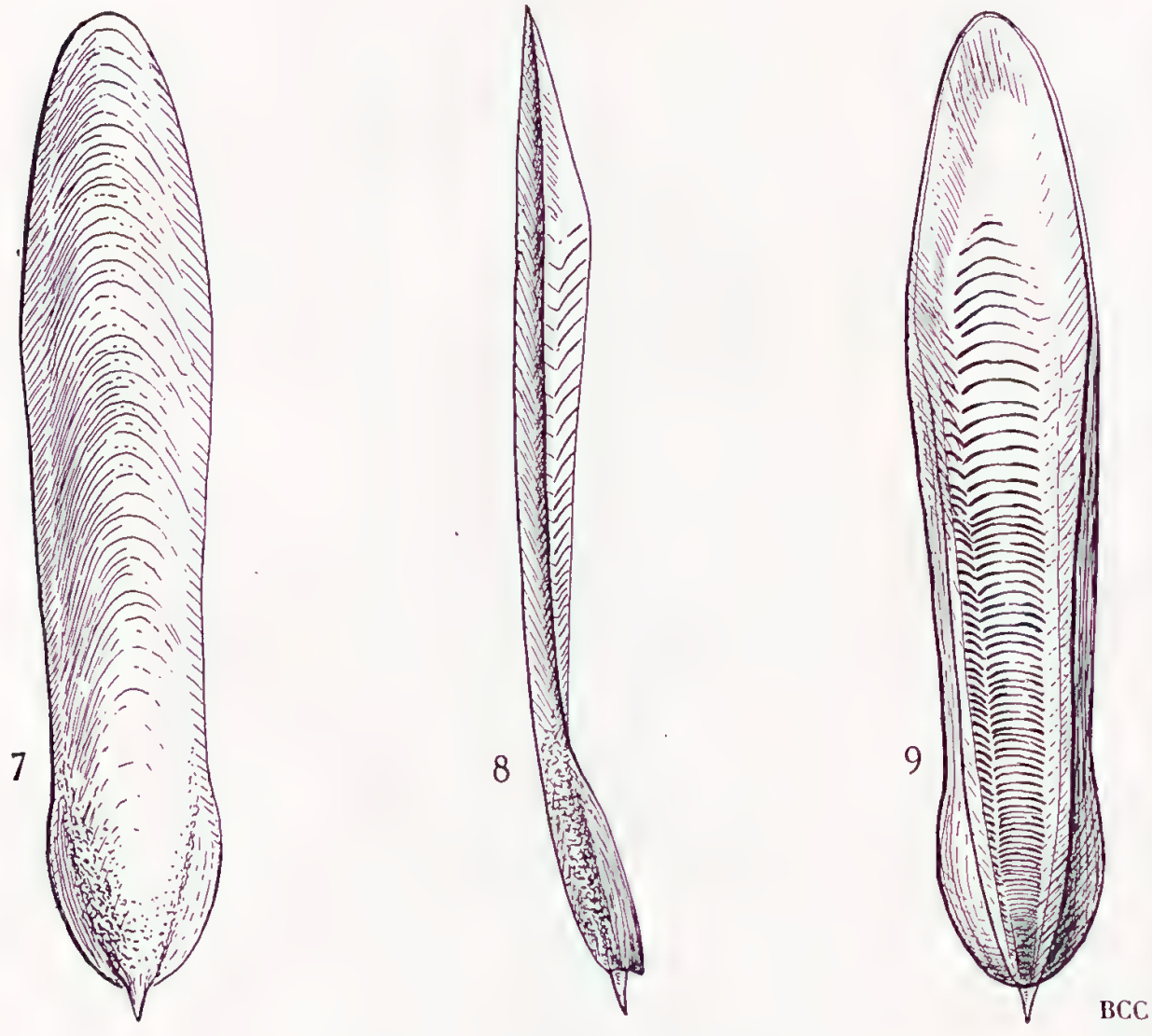


Fig. 7, 8 and 9. *Tenuisepia mira* sp. nov. (× 2).

TENUISEPIA gen. nov.

Sepion small, elongate, narrow, five times as long as broad; inner cone much reduced; no ventral sulcus; dorsum without ribs; spine medium, stout, rounded. Type, *Tenuisepia mira* sp. nov.

TENUISEPIA MIRA sp. nov.

Fig. 7, 8, and 9.

Sepion small, elongate, narrow, sharply rounded anteriorly, a little more than five times as long as broad; inner cone much reduced; dorsal surface cream coloured, smooth except for a finely pustulose area near the posterior end; no

ribs or furrows; chitinous margin narrow; outer cone thin, little calcareous, white, passing in front of the spine as a thin, projecting ledge; ventral surface swollen anteriorly, striated area long, no ventral sulcus, striae arched; spine medium, rounded, stout.

Loc. Queensland: North-West Islet, Capricorn Group (W. J. Kimber).

Type, length 55 mm., breadth 10·6 mm., thickness 4 mm., spine length 1·7 mm., thickness at base 1 mm. Reg. No. D. 10507, S. Aust. Mus.

The only genus which shows any affinity with *Tenuisepia* is *Decorisepia.* The type of *Decorisepia, D. rex* Iredale, compared with *T. mira,* is more than twice as large, much broader, and has the dorsum strongly three-ribbed.

A CUMACEAN NEW TO SOUTH AUSTRALIA

By HERBERT M. HALE, Director, South Australian Museum.

Fig. 1.

Cyclaspis usitata sp. nov.

Female. Integument hard. Carapace a little less than one-third total length of body, its depth more than half its length; surface with numerous pits (producing a somewhat reticulated appearance), and with two transverse ridges, not exceedingly strong, but quite distinct; dorsum with a median longitudinal ridge. Pseudorostral lobes reaching almost to apex of narrow eye-lobe, which bears three lenses. Antennal notch well marked, and antennal tooth rather wide and subacute. First transverse ridge at about first fourth of length of carapace, running down on each side across a low tumidity, and ending a short distance beyond, not extending nearly to lower margin; second transverse ridge behind middle of length of carapace, on each side curving upwards, almost perpendicularly from the lower margin, and ending abruptly in a tiny angular projection before reaching the median dorsal keel. Posterior end of carapace with a median dorsal elevation. Dorsum of second pedigerous segment elevated medianly; exposed median dorsal portions of third and fourth pedigerous segments very short, that of the fourth carinate; fifth pedigerous segment also weakly keeled dorsally, the carina ending posteriorly in a small point, and with a similar lateral carina on each side. Each pleon segment with an obsolete median dorsal ridge and infero-lateral ridges; anterior four segments with oblique dorso-lateral ridges, and the first five with lateral articular processes. Basis of third maxillipeds almost parallel-sided for greater part of length, and produced apically to middle of length of merus, which is produced practically to level of apex of carpus. Carpus of first leg extending nearly to antennal tooth; basis narrowed on distal half, with no marked apical process, and one-seventh as long again as rest of limb; ischium more than half as long as merus, which is considerably shorter than carpus; propodus longer than carpus, which is a little longer than dactylus. Ischium of second to fifth peraeopods short; merus longer than carpus in second, and shorter than, or equal to, carpus in remaining legs. Uropods twice as long as last pleon segment, with the peduncle as long as the rami, which are subequal in length, with the apical half of the inner edges finely serrate.

Colour pale yellow, nearly white, with dark sooty markings on carapace and pedigerous segments.

Length, 10 mm.

Loc. South Australia: Off Outer Harbour, St. Vincent Gulf (B. C. Cotton). Type, female (in S. Aust. Mus., Reg. No. C. 1841).

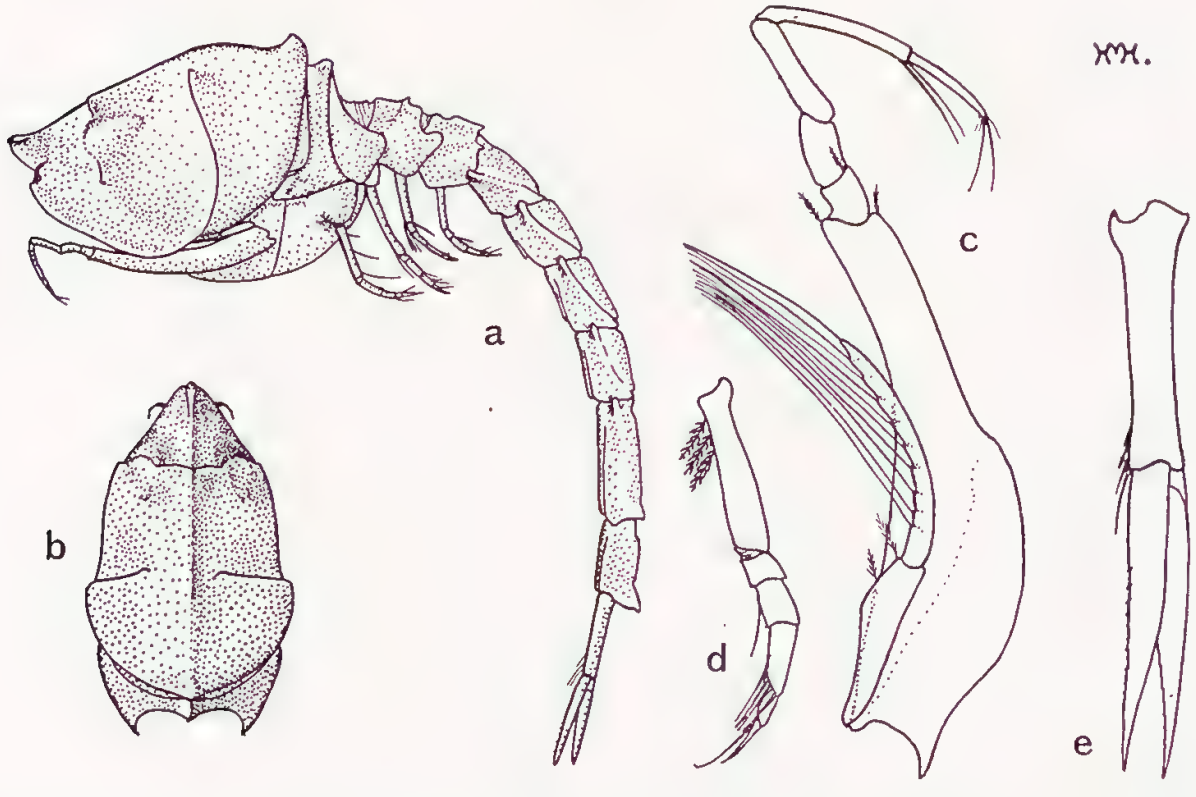


Fig. 1. *Cyclaspis usitata*, type female; a, lateral view (× 9); b, dorsal view of cephalothorax (× 9); c, first leg (× 36); d, fifth leg (× 36); e, uropod (× 36).

This species resembles *C. australis* Sars in some respects, but has no trace of a ridge leading backwards from the antennal notch, while the posterior lateral ridge ends abruptly below the dorsal ridge; the hinder margin of the carapace has a marked dorsal elevation, etc.; the legs are much as in *C. australis*, but the segments of the first antennae are of different proportions.

The holotype of *C. candida* Zimmer, from North-Western Australia, is a male, and the specimen described above may be the female of that species, as its appearance rather strongly suggests. The ridges of the carapace and pleon of the South Australian specimen differ somewhat in disposition; the carapace as seen from above is widest immediately behind the second pair of transverse ridges (instead of at the first ridge), and as there are also other slighter differences I have provisionally described it as new.

The CICINDELIDAE (COLEOPTERA) of the MOUNT LAMINGTON PLATEAU in NORTH-EAST PAPUA

By WALTHER HORN, Berlin-Dahlem.

Fig. 1-4.

In the following I give a list of the Cincindelidae which have been collected by Mr. C. T. McNamara in the Lamington Mountains, New Guinea, at an elevation of 1,300-1,500 feet. The material was communicated to me by the South Australian Museum.

1. Caledonica jordani W. Horn.

2. Cicindela semicincta Brulle.

3. Cicindela funerata Boisduval.

This is aberrant, and is a form intermediate between the typical *C. funerata* as described by Boisduval and the subspecies *barbata* W. Horn.

4. Cicindela bennigsenia W. Horn.

Fig. 1.

The labrum of my two type males is scarcely, if at all, excavated in the middle, and shows only a minute sagittal tooth. The labrum of the male specimens collected by Mr. McNamara show this emargination of the labrum very much more strongly developed, but without the slightest trace of sagittal tooth. The pronotum of the females collected by him shows, just before the basal sulcus in the sagittal line, the same very characteristic small rounded (prominent backward) protuberance noted in my original description. The aedeagus is shown in fig. 1a and 1b. The small constriction before its last third seems to be remarkable, still more the very minute lateral tooth just before its tip. Length, 6·25–7·75 mm. (without labrum).

5. Cicindela io micro-gemmea W. Horn, subsp. nov.

Fig. 2.

♀ ♂ Differt a forma prioritatis capite thoraceque aeneo-metallicis, hinc inde subvirescentibus (non coeruleis); pronotho mas. paullo angustiore, fem. basaliter magis angustato angulisque basalibus multo minus tuberoso-prominetibus;

elytris obscure aeneis subnitentibus, prope marginem (in modo interrupto) viridi-coeruleo tinctis, punctis duo humeralibus in forma lunulae conclusis, gemmis illis magnis coeruleis subsuturalibus multo minoribus viridescentibusque; corpore subtus paullo minus viridi-coeruleo-induto. Labro mas. et fem. longiore, dente sagittali fem. paullo breviore. Long 5·5–6·0 mm. (sine labro).

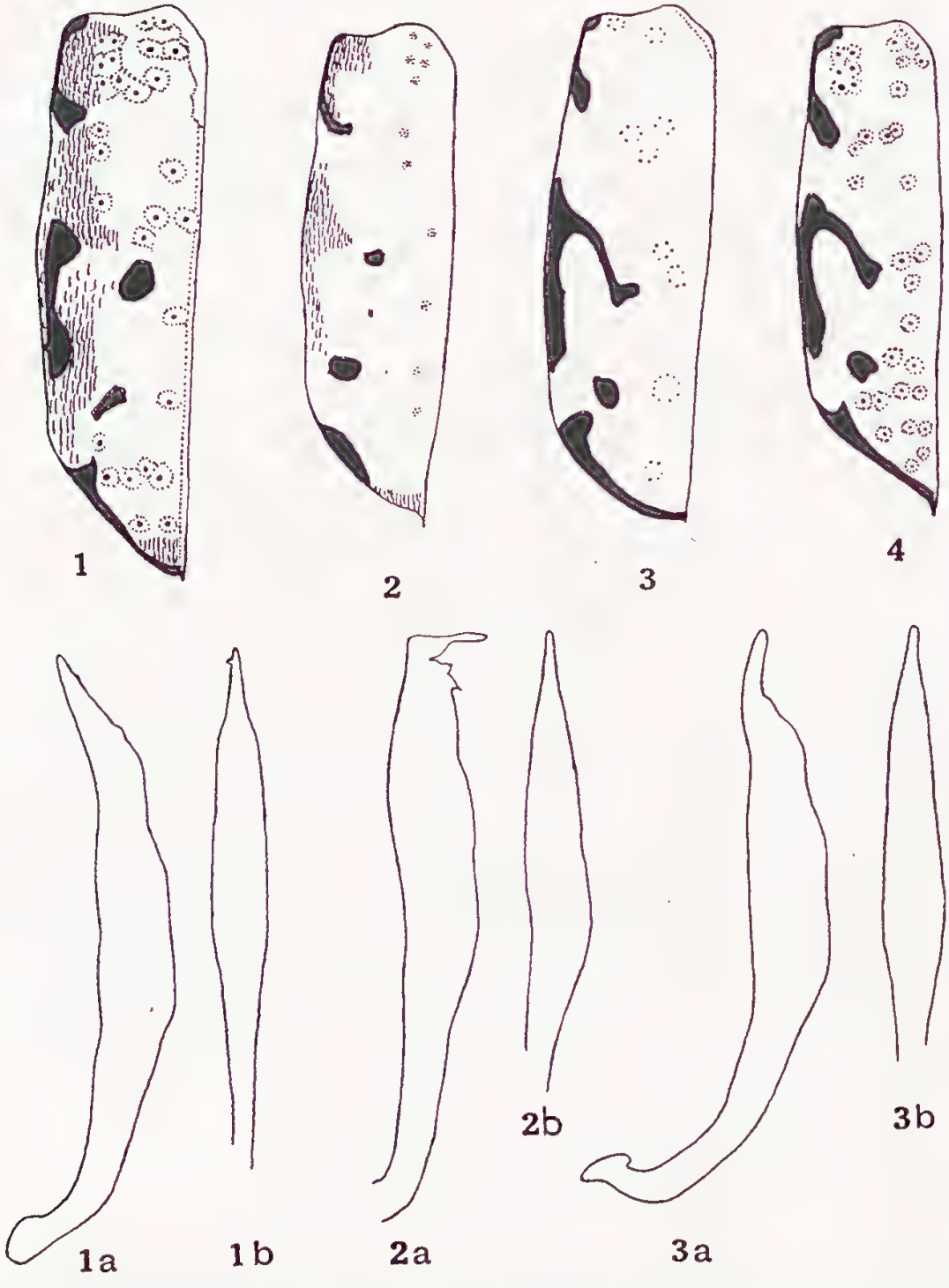


Fig. 1–4. 1, Elytron of *Cicindela bennigsenia* W. Horn; 1a and b, aedeagus. 2, Elytron of *C. io microgemmea* W. Horn; 2a and b, aedeagus. 3, Elytron of *C. guineensis umbrosa* W. Horn; 3a and b, aedeagus. 4, Elytron of *C. guineensis* W. Horn.

The tip of the aedeagus has a very peculiar shape, as will be seen from the figures 2a and 2b. The very fine hook at the tip is almost vertically bent off from the stem. The basal part of the humeral lunula shows (as also often the humeral spot of the typical *C. io*) a reddish colouration. The border of the elytra is of a bluish colouration, especially within the humeral lunula and at the middle part of its length; the fourth sternite of the abdomen in the female is strongly enlarged, and shows in the median line a triangular spot of yellow.

6. CICINDELA GUINEENSIS UMBROSA W. Horn, subsp. nov.

Fig. 3.

♀ ♂ Differt a forma prioritatis toto corpore, 4 primis antennarum articulis, pedibus nigro-aeneis; elytris opacis fere nigricantibus; coloribus illis aut viridibus aut violaceis aut rufo-brunnescentibus deficientibus (gemmis fere totis obsoletis). Long 5·75–6·25 mm. (sine labro).

The upper and under side of the whole body, the four first articles of the antennae, and the legs are of a dark brassy hue. The elytra are almost black without any shine, and only show here and there small traces of the large foveols (the last ones seem to be even less conspicuous, as they do not show any contrasted colouration against the general surface of the elytra, such as they do in the typical *C. guineensis*). The aedeagus is long and fine, and bears a very strong constriction at its termination (fig. 3a and 3b).

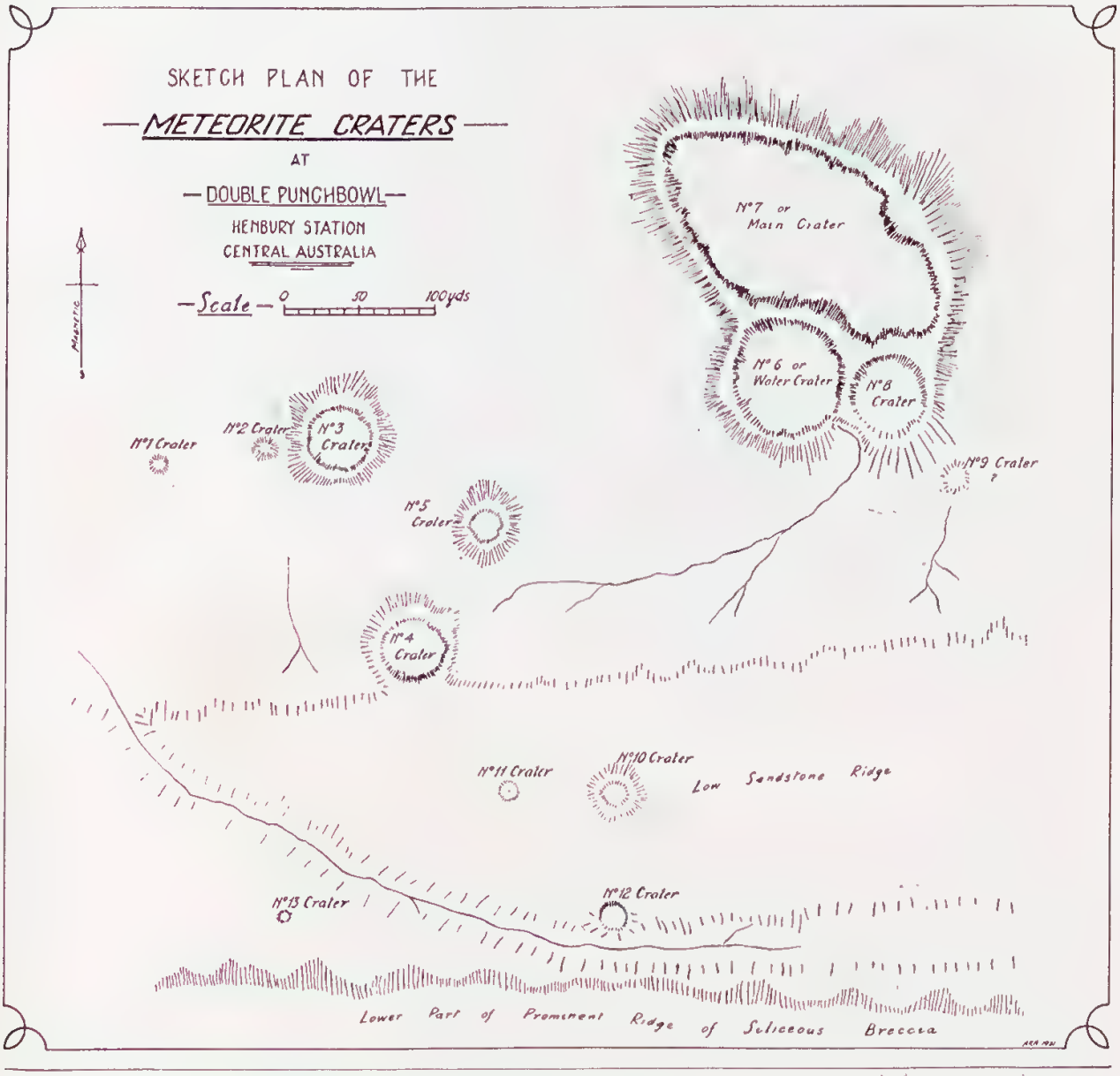
There is only one specimen in the series which proves to be an intermediate form between this new race and the typical *C. guineensis*. This specimen shows much smaller foveols on the elytra, but the remaining foveols possess the contrasted colouration of the typical form. Fig. 4 shows the typical *C. guineensis* W. Horn.

The HENBURY (CENTRAL AUSTRALIA) METEORIC IRON

By A. R. ALDERMAN, M.Sc., F.G.S.

Fig. 1-9.

The occurrence of meteoric iron near Henbury, in Central Australia, has already been described by the writer (1), who noted that the meteoric material occurred in the form of numerous scattered fragments of iron surrounding some twelve or thirteen "craters" (fig. 1).



(1) Alderman, Mineralogical Magazine, March, 1932, Vol. xxiii, No. 136, pp. 19-32.

Since the writer's visit to the locality in May, 1931, hundreds—possibly thousands—of specimens have been removed from the site by unauthorized collectors, so that much valuable information concerning the distribution, etc., has been permanently lost.

Fig. 2. Specimen of meteoric iron weighing 52½ lb. When found the darker area in the foreground was exposed to the air, the lighter portion being buried.

As far as the author is aware, all the material as yet removed from the Henbury area has been found on the surface, and no attempt has yet been made to excavate any of the craters. It is highly desirable that geophysical tests be made before any excavation work is attempted. The considerable cost of a thoroughly adequate investigation of this nature has so far deferred operations contemplated by members of the South Australian Museum and Adelaide University staffs.

The object of the present paper is to describe the nature of the meteoric iron itself. During the author's visit to the locality in 1931 more than 800 meteoric fragments were collected for the South Australian Museum. The total weight of these specimens was about 500 lb., the largest weighing 52½ lb. (fig. 2). Mr. R. Bedford, of Kyancutta, subsequently visited Henbury, and found one specimen weighing 170 lb., removing in all about 510 specimens, which aggregated 321 lb. weight. The South Australian Museum has since purchased pieces, weighing

Fig. 3. Twisted fragment of iron weighing 13 lb., found inside crater No. 3.

59 lb., 31 lb., and 20 lb., from a prospector. Also there is some evidence to hand that further quantities of meteoric iron have recently been removed from the locality.

METEORIC IRON SPECIMENS.

In shape, some of the pieces, particularly the larger ones, resemble entire meteorites, whereas in many others the shape suggests that they have been torn or shattered from large masses. Many small fragments are twisted and bent into unusual shapes (fig. 3 and 4); some of them are thin and flaky, while many others are biconvex. The external form, and also the internal structure, of a very large proportion of the specimens shows that distortion and shattering has taken place. Presumably this happened at the time of fall. The fact that large

craters were formed by the impact of the meteorites, and that the heat so generated was sufficient to fuse the country rock, indicates that an unusually great force was pent up in the meteoric bodies (fig. 5). The force of impact was evidently sufficient to shatter and distort the meteoritic masses.

The evidence appears to indicate that the Henbury material fell as a meteoric shower, in which were included many small fragments of iron and some

Fig. 4. Typical specimens of Henbury meteoric iron.

very large ones. The craters were formed by the impact of the larger masses, which at the same time were intensely shattered, and from which thousands of small fragments were torn and scattered. The fantastically twisted and jagged form of so many of the fragments must be seen to be believed, and it appears difficult to account for them, save by a disruption of the larger masses at the time of impact.

A numerically smaller number of pieces seem to have fallen as separate members of the meteoric shower. These show no signs of disruption, and are generally larger than the twisted fragments described above. They display broad indentations and thumb-marks and the internal structure is normal. The iron is fairly soft and easy to work. It is also very resistant to atmospheric oxidation. A number of fragments were cut, polished, and etched. The etching was effected with dilute nitric acid (4 per cent.); the best results being obtained after a treatment of about two minutes. As noted by Dr. L. J. Spencer (2), the

(2) Alderman, *loc. cit.*, Addendum by L. J. Spencer, p. 31.

etched iron shows well-marked Widmanstatten figures, and "besides kamacite, taenite, and plessite, there are a few minute specks of troilite." Such troilite may be seen in most polished sections, but in one large section examined by the author a distinct vein of that mineral is very prominent, and is associated with a small amount of lawrencite (fig. 6). The average width of the kamacite bands varies from one specimen to another, in some averaging 1 mm., in others 1½ mm.

Fig. 5. Fused sandstone. The upper left portion of the specimen is reddish and sandy. The darker part of the specimen is black vesicular glass.

The width of these bands depends, of course, on the direction in which the section is cut.

The iron may therefore be classed as a medium or coarse-medium octahedrite. Dr. Spencer has remarked on the wavy and cracked nature of the kamacite bands. Some etched specimens show what appear to be closed cracks reaching from one side of the specimen to the other (fig. 7). Such phenomena of strain and disruption are in accordance with the evidence of shattering of the original masses

as indicated by the torn and twisted form of so many of the smaller fragments. The fine striations known as "Neumann lines" are observable in many of the kamacite bands.

CHEMICAL EXAMINATION.

Material for analysis by the author was obtained from a selected specimen by drilling. Attempts were made to estimate iron gravimetrically after four or

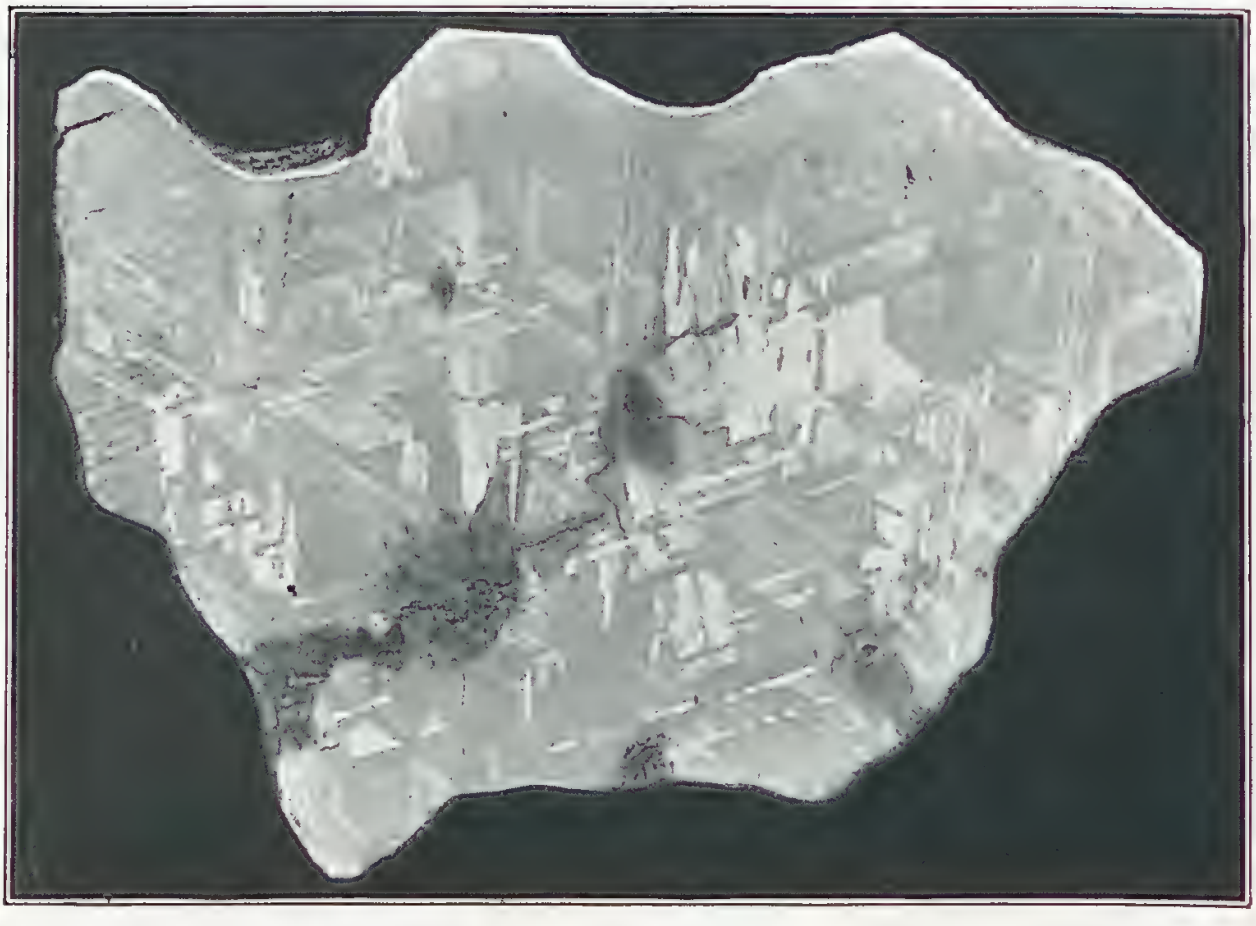


Fig. 6. Etched section showing Widmanstatten figures. The thin black vein consists of troilite with some lawrencite. This vein is seen to follow the edges of the kamacite bands. (Nat. size.)

five precipitations with ammonia. Results from this method were, however, obviously high. It was eventually estimated by titration with permanganate. Nickel was precipitated and weighed as Ni-dimethylglyoxime, and cobalt was estimated by the α-nitroso-β-naphthol method. Careful determinations of carbon were very kindly made for the author by Mr. T. W. Dalwood, of the Assay Department, South Australian School of Mines. The results thus obtained are as follows:

Fe	91·54	per cent.
Ni	7·54	„ „
Co	0·37	„ „
S	0·01	„ „
P	0·08	„ „
C	0·013	„ „
SiO_2	0·03	„ „
Total	99·58	per cent.

The Fe : Ni ratio is thus 12·1. This figure agrees with Dr. G. T. Prior's grouping for a medium octahedrite. The specific gravity, as determined by the pycnometer method, using benzene, is 7·53.

Fig. 7. Etched section of the iron showing the wavy nature of the kamacite bands. Several long, closed cracks may also be seen.

A number of small separate fragments of the iron have been forwarded to Professor F. Paneth, of Konigsberg University, who has undertaken the determination of the helium content, from which an estimate of the age of the meteorite can be obtained.

IRON-SHALE.

A partial analysis was also made by the author of the so-called "iron-shale." This greatly resembles the "iron-shale" found near Canyon Diablo, Arizona.

It is brown to dark-brown in colour, and is magnetic. It appears to consist very largely of limonite and to have been formed from the nickel-iron by weathering. Many specimens show a laminated appearance suggestive of progressive stages in the oxidizing process (fig. 8); others possess the roughly biconvex shape which is typical of so many of the iron fragments (fig. 9). Stains suggestive of nickel may be seen on some specimens. Chemical analysis gave the following results:

Total Iron (as Fe_2O_3)	83·31	per cent.
NiO	5·76	„ „
SiO_2	0·53	„ „
H_2O	9·15	„ „

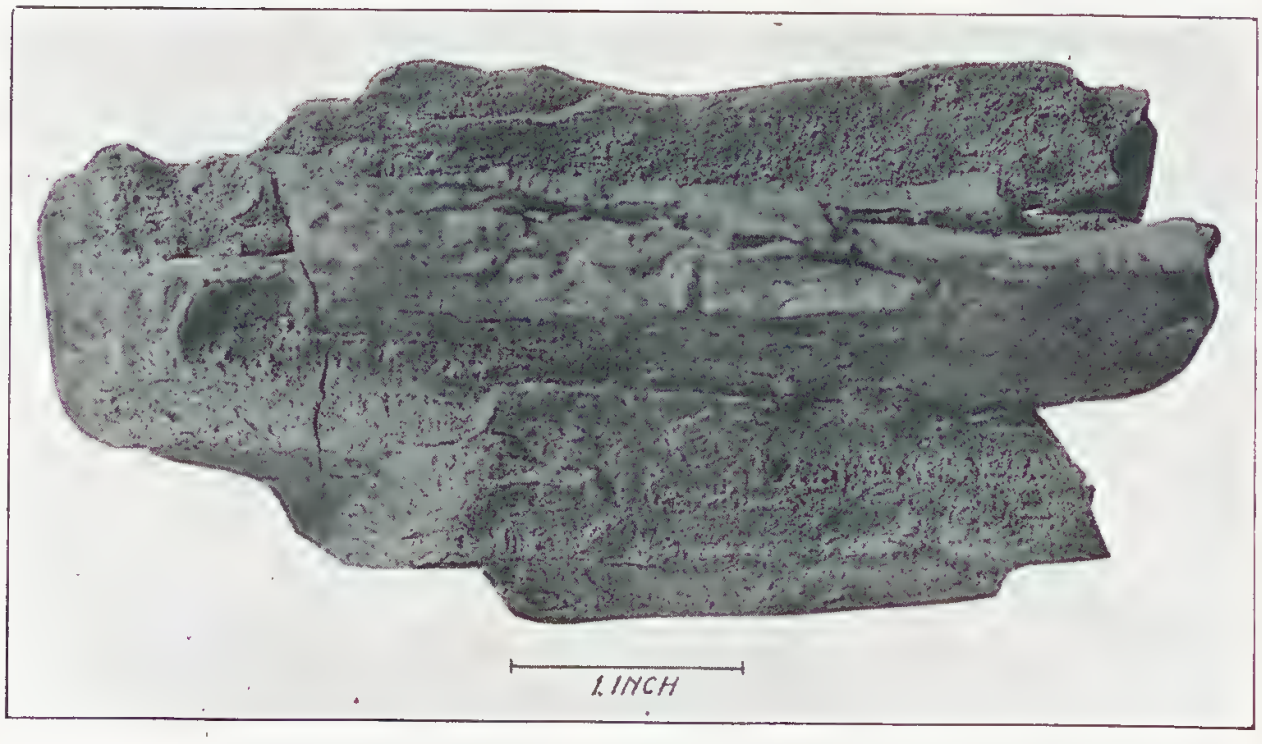


Fig. 8. Laminated "iron-shale."

It is interesting to record that all the iron-shale which the author has examined was found on the crater walls. Mr. Bedford, who found the actual specimen which the author selected for analysis, confirms this statement. From this it seems probable that such material had been buried in the débris of the crater walls until recently, when it was uncovered for the first time. It would appear, therefore, that meteoric iron which is buried below soil and fine fragmentary material would be oxidized more readily into the solid iron shale form than would similar material which is exposed to the air. Oxidized matter would be removed from exposed iron by such agencies as wind and moving water, and in the case of buried iron would probably be retained *in situ* by the enclosing

soil, etc. In a climate as arid as that of the Henbury region (where the average rainfall is about 6 inches per annum), rock exposed to the air dries immediately after the short spells of rain, most of which falls as thunder-showers. The author has described, however, how the craters form natural reservoirs, into which water is concentrated after rain (3). This would surely keep much of the wall material in a state of dampness for a not inconsiderable time after rain.

Fig. 9. "Iron-shale" showing typical bi-convex shape.

One can imagine, therefore, that oxidation would take place more readily in iron which was buried in such a favoured position in the crater walls, and also that the oxidized material would, after its formation, be preserved *in situ*. The oxidation would, of course, proceed much more rapidly if minerals such as lawrencite were present. This mineral was noted in one specimen of the iron examined by the author, but not in any of the numerous other sections. The presence of half a per cent. of silica in the shale indicates that the widespread silicification so noticeable in Central Australia has not been without its effect even on this meteoric material.

Iron-shale similar to that found at Henbury and Canyon Diablo has been recorded from the crater at Odessa (Texas) and near Grootfontein (South-West Africa), in which latter locality it forms an enveloping zone around the giant Hoba meteorite.

(3) Alderman, *loc. cit.*, p. 22.

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